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SEPTEMBER

50¢

World Soaring Championships

PILOT REPORT: Aero Commander 500A

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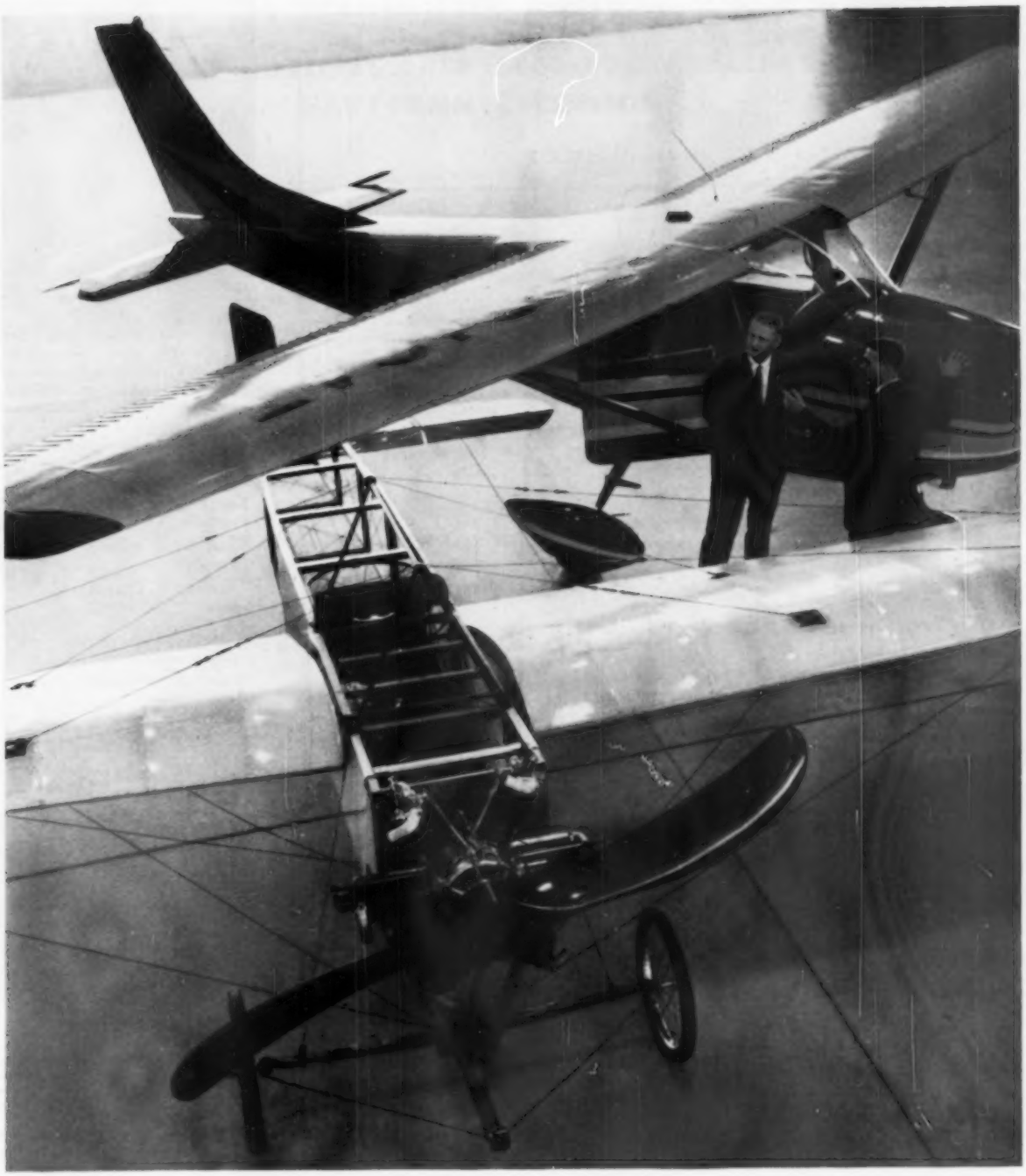

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THE COVER: Aero Design & Engineering's new Aero Commander 500A shows its clean lines while tooling along over Florida. Performance of this airplane is spotlighted in FLYING's check-pilot report on page 26. Color photo: Hans Groenhoff.

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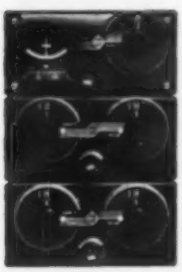

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T. C. Morrow, president, says that Wanda's transportation requirements can be adequately met only by a company plane. The firm's Aero Commander, purchased in 1957, provides the necessary capacity, speed and flexibility. The plane, Morrow states, is in the air 600 hours a year. From one to six Wanda executives and a full-time pilot fly their own schedules at speeds over 225 mph.

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C. H. Swanson, vice-president, sales, states: "Our Aero Commander is one of the company's modern business tools. Recently, by making stops in four major cities in one day, we closed one of the largest sales in our history. Getting the order depended on being there in time. We couldn't possibly have done it without our own airplane."

Wanda's next aircraft? "There's no question," says Mr. Morrow, "when we consider size, speed, performance, economy and safety. It will be another Aero Commander."

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MAILBOX

FLYING TO THE BAHAMAS

I was very interested in your article "So You Want To Fly to the Bahamas" in your June issue. Would you please send me all the information you have on the Bahamas. My son and I are planning a flying fishing trip in that area.

W. G. MENNEN JR., Vice-President
The Mennen Company
Morristown, N. J.

On page 67 of your June issue of FLYING you state supplemental information on the Bahamas is available free. Data includes directory of airports, hotel directory with rates and a folder which includes a map.

I would appreciate receiving this information.

W. E. TYLER, President
Dewey Portland Cement Co.
Kansas City 12, Mo.

• *The overwhelming response to this article has been most gratifying with requests for supplemental information on the Bahamas continuing to arrive with each day's* mail. FLYING *will honor these requests as long as they keep coming.*—ED.

INVISIBLE FOE

The article in "Hangar Flying" (May issue) by Walter E. Mansell was written very descriptively, and from a medical and safety standpoint, was very pointed. From Mr. Mansell's description it would appear that a condition called tetany, due to rapid breathing, was the main cause of his muscle spasm and incapacitation. Hypoxia or decreased oxygen concentration of the air at 15,000 feet altitude at which the Cessna 172 was flying, probably started this cycle of difficulty but was not the final cause. If it were, it would have been relieved during the descent into lower altitudes.

The problem of hyperventilation and resultant muscle spasm (tetany) is best treated by slowing one's respiration. This is not always easy, since anxiety is the main cause of the rapid breathing.

It should be mentioned that this problem is not uncommon, and is seen frequently in the Air Force; especially when oxygen masks are worn. The pilot then becomes more conscious of his breathing and frequently steps up its rate. Another example of hyperventilation would be of an anxious mother, who has stepped up her breathing as a result of seeing her child in potential danger. . . . I mention this to point out that this condition is not peculiar to pilots and can occur at any altitude.

HAROLD N. BROWN, M.D.
Chr. Safety Committee
Flying Physicians Ass'n.
Lombard, Ill.

• *For further discussion of this subject see article "Watch Out for Overbreathing" elsewhere in this issue.*—ED.

ROMANCE IN HELICOPTERS

. . . In commenting on Lieut. Bach's article "I've Never Heard The Wind" (Feb. FLYING), Mr. Jack Haley in your May "Mailbox" section made the statement: "For lack of better terminology, let's say the romance of flying is gone—gone with the wind."

I feel very sure there are wonderful memories of the days gone by; however, I would like very much to enlighten him on one subject. The romance of flying may have gone with the wind but it came back with a bang when the helicopter was fully perfected.

1ST LIEUT. CARROLL L. WRIGHT, USAF
Helicopter Pilot
Luke AFB, Ariz.

HOW CLOSE IS CLOSEST?

A goodly number of our members have called my attention to . . . a picture of the Memphis (Tenn.) Downtown Airport in "Briefings" in your April issue. The caption raises the question "how close is closest," and then seemingly purports to a claim to it being "the closest landing strip to any metropolitan area in America."

We do not have a "landing strip" as

(Continued on page 6)

WORLD'S LARGEST JET FLEET

Of Boeing 707 Intercontinental Jets and Caravelle Jets!

WORLD'S LARGEST AIRLINE

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17 BOEING INTERCONTINENTALS...24 CARAVELLES. World's largest fleet of these two superb jets. They're the fastest long-range and fastest medium-range jets in the skies today. And all 41 will be in service by the end of 1960.

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On any problem concerning breathing systems and equipment, your inquiry would be welcome.

MAILBOX

(Continued from page 4)

such, but St. Paul residents take great state pride in their full-scale major executive airport which does not lay claim to being "the closest" to any metropolitan area, but actually is swallowed up and surrounded by our dynamic metropolitan growth. Headquartered at St. Paul's Holman Field are industrial air fleets that would rival equipment of local-service airlines, and there is a program of planned action for growth and development to maximize its potentials as an executive airport.

Rather than laboriously detail the "vital statistics" of Holman Field, I believe the attached photo graphically tells all.

Who is closest is not of primary importance. What is important is the tremendous value of a "close-in" airport to a metropolitan area. With adjacent industrial sites for development, we in St. Paul are justly proud of our executive airport facilities at Holman Field.

ERV A. TIMM, Manager
Dept. of Transportation
St. Paul (Minn.) Chamber of Commerce.

MISTAKEN IDENTITY?

In the June issue of FLYING you published a letter from David A. R. Dalgetty of Calgary, in which he states that the DC-5 is now flying in the Royal Canadian Air Force.

I'm afraid Mr. Dalgetty is confusing the Douglas DC-5 with the Canadair C-5 (a conversion of the DC-4 M2, North Star).

The C-5 looks exactly like the Douglas DC-4 but in no way does it resemble the DC-5.

JOHN W. DALEY
Montreal, Quebec.

DE-ICING SYSTEM

Your item on an ice-detection device in "Briefings," May 1960 issue, is of interest because Chicago Aerial Industries, Inc. sponsored the development of this device at Armour Research Foundation. We have since applied for patents on the ice detection principles involved and are interested in furthering the development of these principles into a practical device.

At the present time we have not developed the device for any specific aircraft or de-icing system. We are now seeking organizations or companies who may be interested in its further development. Obviously, this ice detector would add greatly to aircraft safety.

O. D. WHITWELL,
Advanced Engineering
Chicago Aerial Industries
Melrose Park, Ill.

QUITE A BIT, WE ADMIT

Reference the July issue "Briefings" on page 8, FAA's Atlantic City Experimental Center.

Runway 13-37? Quite a magnetic variation there. But, then, 10,000 feet will cover quite a bit of territory!

J. C. TENNISON
Tennison Brothers, Inc.,
West Memphis, Ark.

• *It's 13-31, of course!*—ED.

IS THIS FLYING SAFETY?

. . . I fly out of North Philadelphia Airport, and very recently my safety and that of all other pilots operating out of this airport was impaired by the closing of one of the three runways, thus forcing anywhere up to a 50-degree crosswind on some landings.

FAA talks about safety and then allows the closing of a perfectly good 5,000-foot paved runway, thus exposing the pilots who operate out of this airport to unnecessary danger. A candy factory being built at the one end of the runway (half mile from touch-down) is believed to be the reason. The manufacturer doesn't want planes flying over his plant.

Is this flying safety? In the last 15 years no less than three airports have been closed here within a ten-mile area, despite the fact that there are four to five times the aircraft movements now than there were then.

DR. JAMES I. BARDLEY JR.
Philadelphia, Pa.

CAP CADETS SOAR

I have read your magazine for some time and have enjoyed it . . . especially the "Airman's World" and the thought-provoking

editorials by Gill Robb Wilson, your fine publisher. It is because of his editorial on soaring, in the June issue, that I am writing this letter.

He states that the U. S. is lacking in an organized soaring program, which is certainly true. . . . I would like to call attention to the present Civil Air Patrol program which is just getting under way. At present, six wings, California, Hawaii, Michigan, New York, Oklahoma and Texas, are engaged in a soaring program. As you can see we are doing something about the state of affairs of soaring in this country. I hope to see the program extend to other units as soon as possible.

MAJOR LEO W. SAULNIER JR., CAPC.
Warwick, R. I.

• *During the past Easter school holidays, 50 CAP cadets, both girls and boys, from the New York Wing met for a six-day soaring program at Elmira, N. Y. A most successful program, sparked by Richard Nelson (2nd Lieut. CAP), special soaring project officer; Col. Jess Strauss, New York Wing Commander; Paul Schweizer, v.p. Schweizer Aircraft Corp.; Maj. John DeWitt, USAF Liaison officer; the Elmira Soaring Corp.; and members of the Soaring Society of America, along with Capt. Gregory Armston acting as encampment commander. The program covered six full days of indoctrination and flight instruction. The cost, $65, including meals, housing and instruction. Pictured above are Cadets at Elmira preparing for a launch.*—ED.

THE *Comanche* GIVES YOU

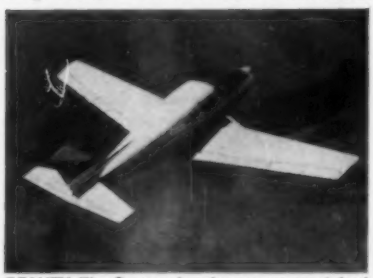
the BEST COMBINATION

of ALL the features you want in a
HIGH PERFORMANCE BUSINESS PLANE

ROOM AND COMFORT. The Comanche gives you the roomiest cabin—no shoulders rubbing shoulders, plenty of leg room—plus the luxury of beautiful new interior styling, new improved ventilating system. Trips seem half as long, thanks to the Comanche's roominess.

LOAD ABILITY. You get more payload in the Comanche—four full-size passengers, full standard fuel load with weight allowance left over. 20-cubic foot, 200-pound capacity baggage compartment is largest of any, with big square door that will take the largest bag.

PERFORMANCE. Advanced aerodynamic design, including laminar flow wing, gives Comanche top efficiency proved by two world non-stop distance flights (Class 4—7,668 miles; Class 3—6,959 miles). Single-piece stabilator gives superior longitudinal stability, less drag.



BEAUTY. The Comanche gives you unmatched eye-appeal. Its every beautiful line from spinner to much imitated swept rudder tells you the Comanche was designed to fly fast, fly right. On the ground or in the air the Comanche draws admiring glances wherever you may go.

RUGGED STRUCTURE. Study the Comanche's rugged structure, the deep massive main spar and you'll understand why the Comanche has an impeccable record of structural integrity. Piper, exclusively, primes all interior surfaces before assembly to reduce corrosion.

ECONOMY. Compare any all-metal plane, equipped as you want it, and see how much further your dollar goes with the Comanche. Lower cost means lower insurance, less depreciation. Simplified systems assure dependability. Hailed as "easiest plane to maintain."

Check, Compare... See why the Comanche is the widest selling high performance, low wing plane on the market today. Your choice of two fine models: for top economy, the Lycoming 180 hp Comanche, 160 mph cruise, $15,600; for top performance, the Lycoming 250 hp Comanche, 181 mph cruise, $19,800. See the Comanche at your Piper dealer's or write for Comanche brochure to Dept. 9-G

ATTRACTIVE LEASE AND FINANCE PLANS

MORE PEOPLE HAVE BOUGHT PIPERS THAN ANY OTHER PLANE IN THE WORLD

PIPER

AIRCRAFT CORPORATION

LOCK HAVEN, PENNSYLVANIA

Briefings . . .

THREE WORLD LONG DISTANCE record flights in 13 months—the latest over the past July 4th weekend—is the present score for pilot Max Conrad and his Piper Comanche N110LF. Out to break the Czech-held closed-circuit nonstop record of 3,084 miles in the International Category 3 Class—not more than 3,858 pounds gross weight

—Conrad exceeded the mark on his fourth lap, went on to cover 6,921.28 miles in 60 hours, 10 minutes; and, incidentally, to exceed his own earlier records for continuous hours aloft. The NAA-observed course followed was Minneapolis via Chicago, Des Moines, Ia., and back to Minneapolis.

FORMER CAP CADETS, 52 of them, are now members of the Corps of Cadets at the U. S. Military Academy, West Point, N. Y. From 26 states and Puerto Rico, these young men represent the pick of the available appointees.

COMPLETELY OVERCOME by response to lower-fare economy-class, tourist-class services on scheduled airlines flying the North Atlantic ended officially on June 30th. Started April 1, 1952 by member airlines of IATA, this service accounted for an estimated 3,017,000 passengers during its lifetime, for a 43 per cent of the total passenger business. Economy, now the predominant class, accounted for 56 per cent in 1958 and 74 per cent in 1959.

UNDER THE NAME of Airways Club, Inc., a unique organization has been formed to serve as spokesman for the many millions of airline passengers, in the matters of safety and convenience; to keep its members abreast of developments in this field and to provide them with "Flight Guard" insurance at low blanket rates. Club president, and director of its Safety Department, is Howard G. Law Jr., air safety specialist with CAA/FAA since 1937. Executive vice-president is William R. Beattie, former executive of Braniff and Delta Air Lines. Offices are at 240 Madison Ave., New York City. Annual membership is $10.

INTERNATIONAL NOTAMS, published weekly by FAA for pilots engaged in or planning foreign flights, is now available by purchase from the U. S. Government Printing Office. Previously distributed without charge to a limited list of users, these Notams may be obtained at an annual subscription rate of $3 for domestic and $5 for foreign mailing.

ON A MISSION OF MERCY, a giant USAF C-124 Globemaster "swallows" a fully assembled (except for rotor blades) three-place helicopter, one of four Hiller 12-Es, which it stowed away in its massive fuselage for emergency delivery to the Chilean government. Within one month after the recent devastating earthquakes hit Chile, over 40 Globemasters had flown relief supplies from the U. S. to the stricken nation. This C-124 was diverted to Moffett Field, Cal., to pick up its urgently needed cargo. The Douglas transport is powered by four Pratt & Whitney R4360s.

TWO U. S. AIR FORCE OFFICERS are named winners of the 1960 Harmon International honors for the world's outstanding aviator and aeronaut. Capt. Joe B. Jordan (below) was chosen to receive the Aviator's Trophy for piloting a Lockheed

F-104C Starfighter to a new world jet altitude record of 103,395.5 feet (at Edwards AFB, Cal., Dec. 14, 1959) and simultaneously establishing the first "time-to-climb" record for 30,000 meters; his time, 15 min. and 4.92 seconds. The Aeronaut Trophy honors Capt. Joseph W. Kittinger Jr. (below) for making a new altitude record in

an "open gondola" balloon ascension to 76,400 feet and then parachuting from this altitude, also a record jump, at Holloman AFB, N. M. Traditionally, these trophies are awarded by the President at a White House ceremony held in the late summer or the fall.

IN THE WORLD Soaring Championships, held in Cologne, Germany, June 4-17th, Rudolfo Hossinger of Argentina, flying a British-built Skylark III sailplane, won the Open Class competition. The German pilot, Heinz Huth, was first in the Standard Class with a Ka 6Br sailplane. U. S. team pilots, Richard Johnson and Richard Schreder, finished 15th and 16th, respectively, in the Open Class. Paul Bikle came in 12th in Standard Class.

PLANE RIDES, as a money-raising aid, are helping many charities to better their budgets. Such flights should be planned only after checking with local FAA representative. In general, FAA says the charity must be an accredited organization and pilots contributing their time for flights must have minimum of 200 hours; and the airplane current 100-hour inspection.

AT A COST of $2,000,000, a multi-channel VHF aeronautical radio system, jointly financed by British West Indian Airways and International Aeradio, Ltd., now links the Eastern Island Territories of

(Continued on page 10)

Get your Master's Degree on land and sea!
. . . in the **BIG NEW LAKE 4-PLACE AMPHIBIAN**

Free amphibious flight instruction puts new experience in flight at your command . . . in America's most useful plane!

It isn't every day you can kill two birds with one stone. It isn't every day that a man who has earned his wings can treat himself to a whole new experience in flight . . . and also move up another notch in aviation!

A magnificent land plane, the new Lake LA-4 now puts amazing new stability in rough water handling. New V-bow . . . new long sleek hull . . . new, lighter wing loading provide new gentle let-down, new smooth ride, new handling ease you won't believe until you fly it. Take off! —in only 1125 feet you cease to trail a ripple, even with full load!

If you say, "But I don't know how to fly a boat," we have three answers. First is, "You have lots of company." Second is, "It's simple." Third and best is this: The factory-trained flight instructor at your nearest Lake dealer's is ready to show each new owner how, right now.

Take the lead! Stay ahead of the trend — be at home on both land and water! Find out what America's one-and-only single-engined amphibian can do for you . . . and your business, too. You'll be flying Lake's new LA-4 in a week — no more!

Start today to earn your wings . . . on *water*, too. Write or phone for new Lake specifications and details of free flight instruction plan, *now*.

Wheels up! In just 650 feet, on land, Lake leaves the earth behind! On land or water, the LA-4 gets you in and out of more places than any land *or* water plane can do.

Man, you're moving! Short take-off! Sharp climb! From land or water the Lake Amphibian takes to the air as if it had its home up there! Glide? — you'll know how the birds feel!

Lake AIRCRAFT CORP.

No other plane... looks... flies... like the Lake

MANUFACTURERS of the Lake LA-4
Sanford, Maine • Telephone: 2390
John F. Strayer, President

Want to expand in aircraft? Dealer franchises are open in selected areas, both in the United States and abroad.

Briefings . . .

(Continued from page 8)

the West Indies. Inaugurated last June, the network has a capacity of 12 separate and simultaneous voice channels, and provides an extensive area-coverage air-ground system. The main route runs from Trinidad through Grenada, St. Vincent, St. Lucia, Dominica, Antigua and St. Kitts, and through a link with All America Cable and Radio Corp., to St. Croix, Puerto Rico, thence by coaxial cable to North America. There are spur circuits from Grenada to St. Vincent; St. Lucia to Barbados and Martinique, and from Antigua to Guadeloupe.

SUMMERTIME WEEK-END MOTORISTS get direct and up-to-the-minute traffic information between Philadelphia and its outlying Atlantic Ocean seaside resorts through the "Skyway-Highway Reporter" Piper Tri-Pacer. A public service provided

jointly by Radio Station WIP and Delaware Aviation Corp., N. Philadelphia Airport, the aerial traffic survey is directed by B. D. (Bud) DeWeese *(left)* of Delaware Aviation and Varner Paulsen, WIP program director, who also pilots as he broadcasts.

LAST YEAR both New York State and Ohio aviation authorities, as an aid to navigation, installed air markers on the major interchanges of their respective state turnpikes. Many pilots are still unaware that these markers exist for their convenience and safety; were installed for this purpose at considerable cost and repainted as the needs demand.

A NOVEL TRANSPARENT self-adhesive tape, a handy item for marking mileage on sectional aeronautical charts, is a new product offered by Aviation Equipment Co., Box 5983, Birmingham, Ala. Called "TC Air Marker," this tape features a specially treated adhesive which allows it to be used repeatedly. Each tape is 6¼ inches long and ½ inch wide; equal to 50 scale miles on a sectional chart. List price is $1.25 per package (enough for 1,000 scale miles).

SEVENTY-SIX private and student pilots, out of an original enrollment of 131, were awarded Certificates of Completion at conclusion of New York State's first state-sponsored Ground School Refresher Course, at Colonie, N. Y. But one phase of the State's Bureau of Aviation program to improve technique and knowledge of New York's 20,000 pilots, attendance at eight out of 12 weekly sessions, is required for "graduation." Of the 76 completing this course, 30 had perfect attendance, 31 others missed only one session.

IN MANHATTAN BEACH, Cal., Nova Tech, Inc. announced a new Omni indicator. An all-transistor unit with a guaranteed accuracy of two degrees and automatic To-From meter, it weighs just 12 ounces; sells for $385. Trade-named the Nova/Star Omni, this instrument is self-contained and designed to operate in conjunction with any standard-make VHF receiver, as well as all Nova-Tech transceivers, including the TR-102, 102A, Nova/Star, HR-1 Helicopter Radio, and Civil Air Patrol radio TR-102.

A NEW VHF RECEIVER for home, office or airport is announced by Harron Labs., 42-10 220th St., Bayside, N. Y. Called AIR-COM, this receiver is designed to monitor calls within the 118-135 mc range. The set features an automatic squelch, seven tubes plus rectifier, five-inch speaker, whip antenna, and is said to be absolutely drift-free. AIR-COM operates on 110 volts AC/DC; is housed in an attractive Bakelite cabinet, and priced at $49.95.

NOT AN UNCOMMON SIGHT these days is a fly-away formation of new aircraft from plant to purchaser, but when nine twin-engine executive airplanes in three formations leave their respective plants in the space of one week it is worthy of note.

First were these three Beechcraft Travel Airs headed for Los Angeles to join North American Aviation's corporate fleet. The same scene took place at Bethany, Okla., when three Aero Commanders flew off to overseas purchasers—two in Brazil and one, a radar-equipped 680-E, to the governor of West Pakistan. And following these, were three Cessna 310s departing Wichita to Switzerland, Libya and South Africa.

PIPER AIRCRAFT has announced purchase of the Aero Products Laboratories, Phoenix, Ariz., manufacturers of electronic equipment, and subsequent transfer of that firm's inventory to Vero Beach, Fla., Piper's development center. Principal among Aero Signal's products is a lightweight low-frequency Radio Direction Finder which Piper will continue to manufacture, under the new name of AutoNav, and offer as optional equipment on all single-engine Piper models. The low-cost

(Continued on page 96)

NOT TO BE CONFUSED WITH an interior decorator's scheme for an earthbound luxury mobile home, this is the cabin of a Convair 440, converted to an executive flying office for The Coca-Cola Company of Atlanta, by Remmert-Werner, Inc. of St. Louis. Designed for comfort and utility, the airplane also is equipped with the latest radio and electronic equipment and safety features, including radar. At recent Reading (Pa.) Aviation Meeting, this plane won Best Interior Award in its category.

Now 19" longer than before! Inside, the new Beechcraft Travel Air has 15 cu. ft. more space for passengers and baggage than any twin in its class.

Another reason why you're ahead with a Travel Air . . .

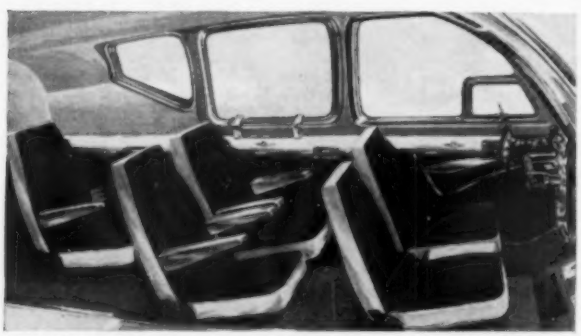
No Other 5-Place 200 mph Twin Comes So Close To Single-Engine Operating Costs:

Even at 200 mph, the Beechcraft Travel Air uses only a little more fuel than many single-engine business planes. And it costs even less—far less—to buy and to operate than many twin-engine business planes with which it may be compared. Lower fixed annual costs, including lower insurance rates, and lower direct operating costs add up to thousands of dollars in savings for the owner of a Beechcraft Travel Air.

A challenge to fly? Not at all. In fact, the Travel Air is so simple and easy to fly that many new pilots have actually learned to fly in it! And multi-engine pilots who have flown it love it. Want more facts? Sure . . .

- **Lowest fuel and oil costs**—you can get up to 11 miles from each gallon of gasoline.
- **Extra-long range**—you can fly more than 1,200 miles and still have a fuel reserve.
- **Single-engine maintenance costs**—both 180 hp Lycomings can be overhauled at Beech service stations for about the cost of overhauling just one 260 hp engine.
- **Quietest twin in the sky**—even at 200 mph, you converse easily and cruise relaxed in "Quiet Sealed" comfort unmatched by any twin.
- **Big "flight planned" instrument panel** with room to put a wide range of the newest radio and instrument equipment within easy reach.

See and fly the new Travel Air at your Beechcraft distributor's or dealer's. And, for illustrated Beechcraft brochures, plus details of low-cost Beech financing plans, write Public Relations Dept., Beech Aircraft Corp., Wichita 1, Kansas, U. S. A.



New 5-seat interior with individually reclining chairs has plenty of head room, hip room and leg room—even for five 6-footers—plus big baggage area. All interiors custom finished in rich fabrics and leather trim in your choice of colors.

Beechcraft

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AND YOUR FUTURE

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Address .....

City.....Zone... State.....

Veterans: Check here ☐ for Special Veteran Training Information.

FLYING CALENDAR

September 3-4—Two-day Air Youth Show, Wirt Field, Newton, Kan., sponsored by Wichita Air Youth, Inc. Co-sponsored by Richard Gilbert American Legion Post 256 in conjunction with State A.L. convention. Exhibits latest business, pleasure aircraft, aerobatics, parachute jumps, jet flight and formation, crop dusting.

September 3-5—Tenth Anniversary Kentucky Jaycee Air Tour. Kick-off breakfast and briefing, Bowman Field, Louisville, Ky. Tour touches such points as Mammoth Cave, concludes at Middlesboro, Ky., on the 5th. Standard Oil of Kentucky provides free aviation gas used on tour. Open to any who can supply own transportation. For info: Kentucky Jaycee Air Tour, 670 S. Third St., Louisville 2, Ky.

September 3-5—National Air Rally, sponsored by National Aeronautic Association. Midget air racing, sailplane demonstrations, parachute jumping, antique and home-built aircraft, model airplane flight demonstrations. Orange Airport, Orange, Mass.

September 3-5—Northwest Sectional Convention, the 99s, sponsored by East Idaho Chapter, Idaho Falls. Banquet, spot-landings, fashion show. Contact: Elaine Loening, Star Route, Salmon, Idaho.

September 3-5—Flying Farmers meeting, Hershey, New Holland, Gettysburg, Pa.

September 3-5 — Schweizer 1-26, One-Design Sailplane Regatta, Harris Hill, Elmira, N. Y. Visitors welcome, demonstration flights available.

September 4—Fourth Annual Fly-in Breakfast, Williams Municipal Airport, Williams, Ariz., in conjunction with 20th Annual Labor Day Rodeo; breakfast, 7 to 11 a.m., served by Bill Williams Mountain Men. Co-sponsored by Williams-Grand Canyon Chamber of Commerce and Williams Flying Service. Unicom on 122.8 mc. For information: Williams-Grand Canyon Chamber of Commerce.

September 4-5—National Championship Air Races, Lakefront Airport, Cleveland, Ohio.

September 4-5—Eighth Annual Oakland Air Fair, Metropolitan Oakland International Airport, Oakland, Cal., sponsored by Oakland Junior Jaycees, in cooperation with Oakland Naval Air Station. Features military and civilian aircraft in air and static display.

September 5-11—The 1960 Farnborough display, annual flying show of the Society of British Aircraft Constructors, Farnborough, England.

September 8-9—1960 Engine and Operations Symposium, Airwork Corp., Millville, N. J.

September 8-9-10—The 1960 National Convention, OX5 Club of America, Tower Hotel Courts, Dallas, Tex. Convention Public Relations, 2720 W. Mockingbird Lane, Dallas 35.

September 10-11—Annual Meeting of the Western States Ass'n of Sheriff's Air Squadrons, at Bass Lake, Fresno, Cal.

September 11—Fourteenth Annual All-Eastern National Air Show, Municipal Airport, Quakerstown, Pa. Features Hal Krier, Bill Adams, Bill Sweet; also Antique and Experimental Aircraft Fly-in. Trophies. Write George Setmann III, Managing Director, Municipal Airport.

September 11—Free Fly-in Breakfast and Flight Festival. Prizes. Flight contest, aerial demonstrations, static display. Contact: Robert J. Ware, Harvey Young Airport, Tulsa, Okla.

September 11—Air Meet, Chicago-Area 99s, DuPage Airport. Open to women pilots. Information: Mrs. Bee Siemon, Box 275, Wayne, Ill. Phone: JUno 4-4977.

September 14-16—Annual Meeting, National Ass'n of State Aviation Officials, Worth Hotel, Jackson, Wyo.

September 16-17-18—Ninety-Nines Inc., Southwest Fall Sectional Meeting, Hotel El Dorado, Sacramento, Cal.

September 16-17-18 — Fall meeting of North Central Section, 99s Inc., at Sheraton-Cleveland hotel, Cleveland, O. Contact: Eva A. White, North Central Section 99s, 128 S. Washington St., Naperville, Ill.

September 16-17-18 — Second Annual Max Conrad-Elko (Nevada) Air Race. X-country for stock aircraft of not less than 85 hp, or more than 350—twins, 650 hp max. Banquet. Sponsored by Elko Chamber of Commerce. Info: Max Conrad-Elko Annual Air Race, Box 185.

September 20-22—National Business Aircraft Association's 13th Annual Meeting and Forum, Lockheed Air Terminal, Burbank, Cal., and Ambassador Hotel, Los Angeles. Fly-by and static display.

September 23-24-25—Fifth Annual Small Airplane Race, Muskegon, Mich., sponsored by Michigan Chapter 99s. Entries close September 12. Contact: Velma Del Giorno, 809 Shoreham Rd., Grosse Pointe 36, Mich.

September 23-24-25—Air Tour, meets Columbia, Mo., Thursday evening, September 22. Contact: Paul Huston, Chairman, Inter-Clubs Air Tour Committee, 1936 Allen Drive, Jefferson City, Mo.

September 24-25—New York Flying Farmers Tour around Lake Ontario.

September 25-26—International Northwest Aviation Council, 24th Annual Convention, Harrison Hot Springs, British Columbia. Chilliwack Airport. Transportation between airport, resort.

September 26-30—Third ISA Instrument-Automation Conference and Exhibit of 1960; ISA's 15th Annual Meeting, Coliseum, New York, N. Y.

October 1—Second Annual Fly-in, held by FAA at Experimental Center, Atlantic City, N. J. Aircraft owners and pilots welcome.

October 1-2—First Annual Fly-in Weekend and Breakfast, sponsored by Morrisville, Sr. Squadron, CAP, in conjunction with Stowe Area Ass'n. Weekend package plan available. Morrisville State Airport, Vt. Foliage tour, street dancing, tennis, golf, horseback riding, chair-lift ride. Rain date, Oct. 8-9—breakfast on Oct. 2 or 9. Contact: Stowe Area Ass'n. Inc., Stowe, Vt.

October 1-3—Florida Aero Club Weekend Flight to Nassau, B.W.I. British Colonial Hotel, $53.50 for complete package. Contact: Harry B. Collins, Air Cruise Director, 375 N.E. 154th Street, North Miami Beach 62, Fla.

October 2—Annual Air Show, sponsored by Doylestown Kiwanis Club, Skyron Bucks County Airport, Doylestown, Pa. Features Hal Krier, Bill Adams, Bill Sweet; also gliding and soaring demonstrations, experimental aircraft fly-in, trophies. Rain date: October 9. Contact: Dom Di-Valerio, Doylestown Daily Intelligencer, 10 Court St.

Calendar items must be received at FLYING's editorial offices, 1 Park Avenue, New York 16, N. Y., two months prior to the event.

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GRAND CANYON EAGLES

A behind-scenes report on Arizona's flying Hudgin brothers—owners of Grand Canyon Airlines, Grand Canyon Airport, Hudgin Air Service and Hudgin Aero-Tech

by HERB FISHER
international aviation authority, veteran test pilot, author

Center for charter service, Piper sales, maintenance and flight training is Hudgin facility at Tucson. (All 5 brothers join mechanics in maintenance work.)

At Hudgin-owned Grand Canyon Airport, brothers Palen, Louis, Henry and Walter witness shakedown flight of their new 47G-3 Bell. Al is at controls.

Inspecting Champion-fired Lycoming engine at Hudgin Air Service maintenance facility in Tucson are (l/r) Henry, Palen and Louis Hudgin.

The five Hudgin brothers were born in a dusty little cow-town on the Mexican border. They spoke Spanish as fluently as English, were as familiar with Apache customs as they were the three R's, and shared a common conviction regarding the nearby Santa Rita Mountains—that one day all five would soar like the great bald eagle above those lofty peaks.

Of the brothers, Al Hudgin was the edgiest to get up there with the eagles. In 1928, he rented an old Curtis N-9, taught himself to fly it. During the next four years, he flew everything he could get his hands on—in fact, 150 different models! In the eyes of Nogales, Ariz., townsfolk, Al was a hero. But in the eyes of Mexico and Arizona lawmen, Al's eagle antics verged on villainy. Landing on main streets to gas up, for example, scares horses and makes a shambles of siestas. Mexican police ordered Al to keep his flyin' jenny north of the border. North of the border, Tucson police threw him in jail for landing alongside a sorority house where flapper-era coeds were sunbathing . . .

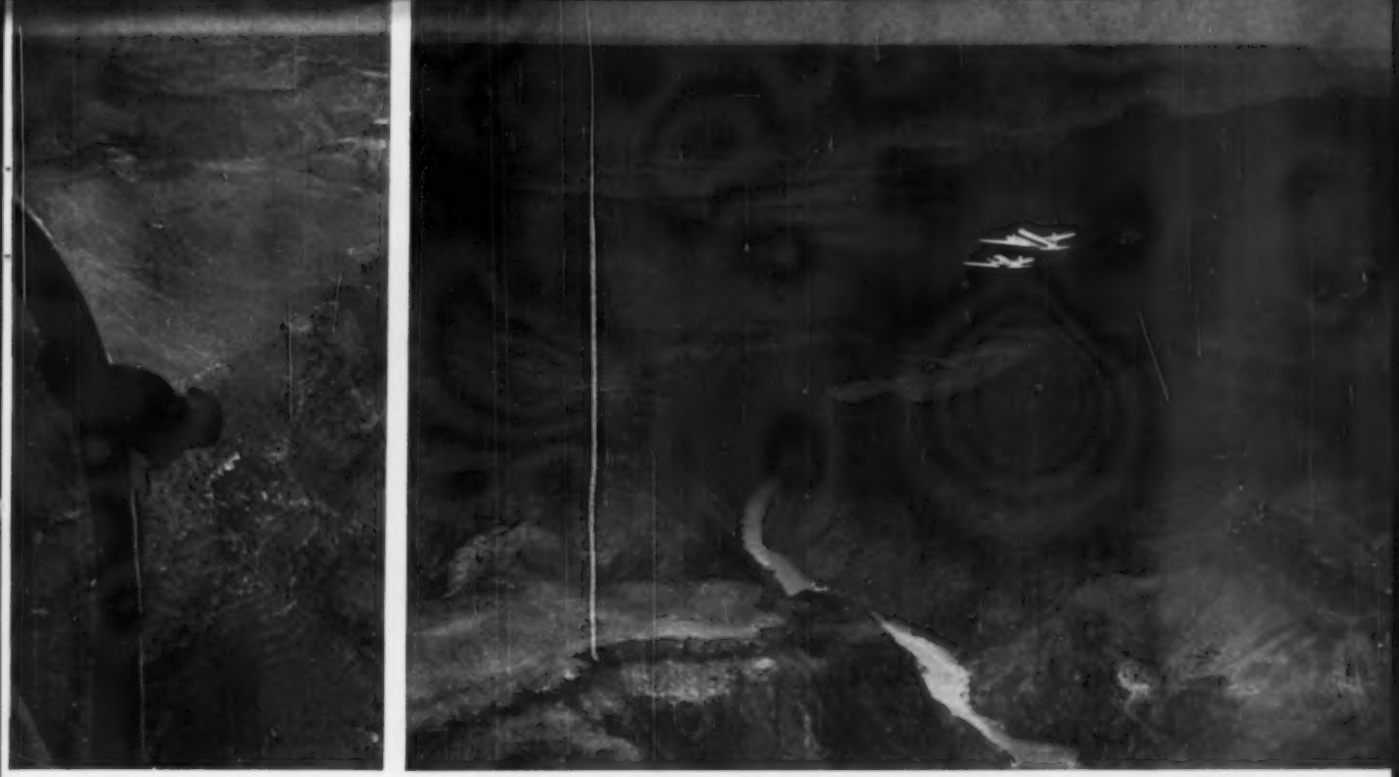
Al was convinced the art of eagles should, indeed, be put to more beneficial use. He offered his services to Mexican revolutionary forces. The rebels told him they didn't need a one-man air force. Okay, he'd make it a five-man air force. Al taught older brothers Louis and Walter to fly. When kid brothers Henry and Palen were 12 years old, Al taught them to fly.

Meanwhile, however, Al began to think he'd rather make money with his flying than fight wars. (Later, during World War II, Al was Chief of Flight for the Tucson Division of Consolidated Vultee—authorized to fly anything the Air Force had.) Who had money in the early 30's? Texans. Al opened a flight school in Del Rio. But trying to interest Texans in making like eagles proved hopeless. The next year, Al returned to Nogales and started a flight school there.

In 1938—unable to pay grocery bills, let alone installments on his plane—Al scraped up $22, roared off over the Santa Ritas, set down on a dirt airstrip outside Tucson and planted his flight school shingle there. He worked hard. At the end of six months he was purchasing a second plane and was inviting a brother to join in the fun . . .

Today, the easy-going, fun-loving (but serious-minded when it comes to flying) Hudgin brothers are an institution in the Grand Canyon State. They've built a unique, family aviation empire—no subsidies, just "guts and gall."

All five (Al's president) own and operate the 987-acre *Grand Canyon Airport* and internationally famed *Grand Canyon Airlines*, a tourist service devoted to awesome sight-seeing flights down into "the grandest of the Seven Wonders of the World." With its 10,000-ft. runway, Grand Canyon Airport is the longest privately owned and maintained airstrip in the world. The Hudgins have their own refueling trucks, a road grader for maintaining 2½ miles of private highway, a Diesel-generator powerplant, their own 11-mile telephone



On helicopter tourist flight through Grand Canyon, Al Hudgin hovers so passengers can watch other sight-seers fly 3,000 feet down into the Canyon via Comanche and Dove. "If you know the Canyon and have dependable equipment, you're as safe as you are in your own backyard," Al says. His 10-year record running Grand Canyon Airlines confirms it.

system, water system, and other standard airport facilities.

In Tucson, Al himself owns (his brothers help him operate) *Hudgin Air Service*, an all-purpose charter operation and Piper Aircraft sales/service center for Southern Arizona and Sonora, Mexico. With several hangars, H.A.S. does general servicing (including complete engine overhaul) on outside aircraft as well as on its own. H.A.S. sells 20 to 25 planes a year, led in statewide Piper sales last year. Charles Jenkins is Head of Maintenance; pilot-mechanic Dean Terry flies charter.

The brothers also own (Al is president) *Hudgin Aero-Tech, Inc.*, their flight school at Tucson. It's approved for instrument-through-commercial ratings. V. L. "Casey" Jones, an old friend of mine and another "aviation legend" in the Southwest, is Flight School Director.

The combined Hudgin operation—Piper Tri-Pacers, Apaches, Comanches, Super-Cubs, a DeHavilland Dove and new 47G-3 Bell helicopter—flies 4,000 hours a year under Arizona's drastically varying operating conditions. *The Hudgin brothers' safety record remains unblemished.*

Al had this to say about it: "Herb, if you know the Grand Canyon, you're as safe as you are in your own backyard and can go nearly any place an eagle can in it. We fly tourists, safely, as much as 3,000 feet *below* the North Rim! But if you don't know the Canyon—well, don't ever try flying in it 'cause it can be sheer hell. There's no way of judging size and distance of things, for example—those buttes are really deceiving!

"Then there's another factor *most vital* to flying the Grand Canyon—*or any place in this mountain-and-desert state*, for that matter: Your *engine* has to be as *dependable* as you can possibly make it—almost to the point of perfection, in fact. That's why you're here, Herb—'cause you heard we wouldn't send our planes up without Champion spark plugs in them . . . *and you heard right!*"

Most spectacular of Hudgin Air Service missions are those you seldom hear about. A few recent examples: Towing, at the end of a cable, a radioactive "item" from "somewhere in the east" to "somewhere in the west" — tricky business. Flying *hundreds of times* through *every* smelter plume in Arizona—altitude, 50 feet—to check smoke content. Taking ice crystals from clouds at 22,000 feet—in an Apache—for the University of Chicago. Taking air samples at 18,000 feet—Tri-Pacer and Super-Cub—for the University of Arizona's Atmospheric Research Department. Counting "dust-devils" (desert whirlwinds). Towing gliders. Flying sportsmen or mining engineers to remote spots throughout Mexico. Putting smoke-jumpers or supplies in at forest fires raging along sometimes almost inaccessible heights or canyons. (*The Hudgin brothers pioneered fire-drop techniques now used in the Southwest.*) Patrolling powerlines via Cub or Tri-Pacer. Surveying in Navajo Land, a 22,000-square-mile wasteland meaning death to the careless. Uranium prospecting in hazardous places like the Painted Desert or Monument Valley. Cloud seeding. Flying an air-ambulance, on immediate call, any place in North or South America. Air-taxiing businessmen any place, any time. Linking remote ranches or mines with the airlines.

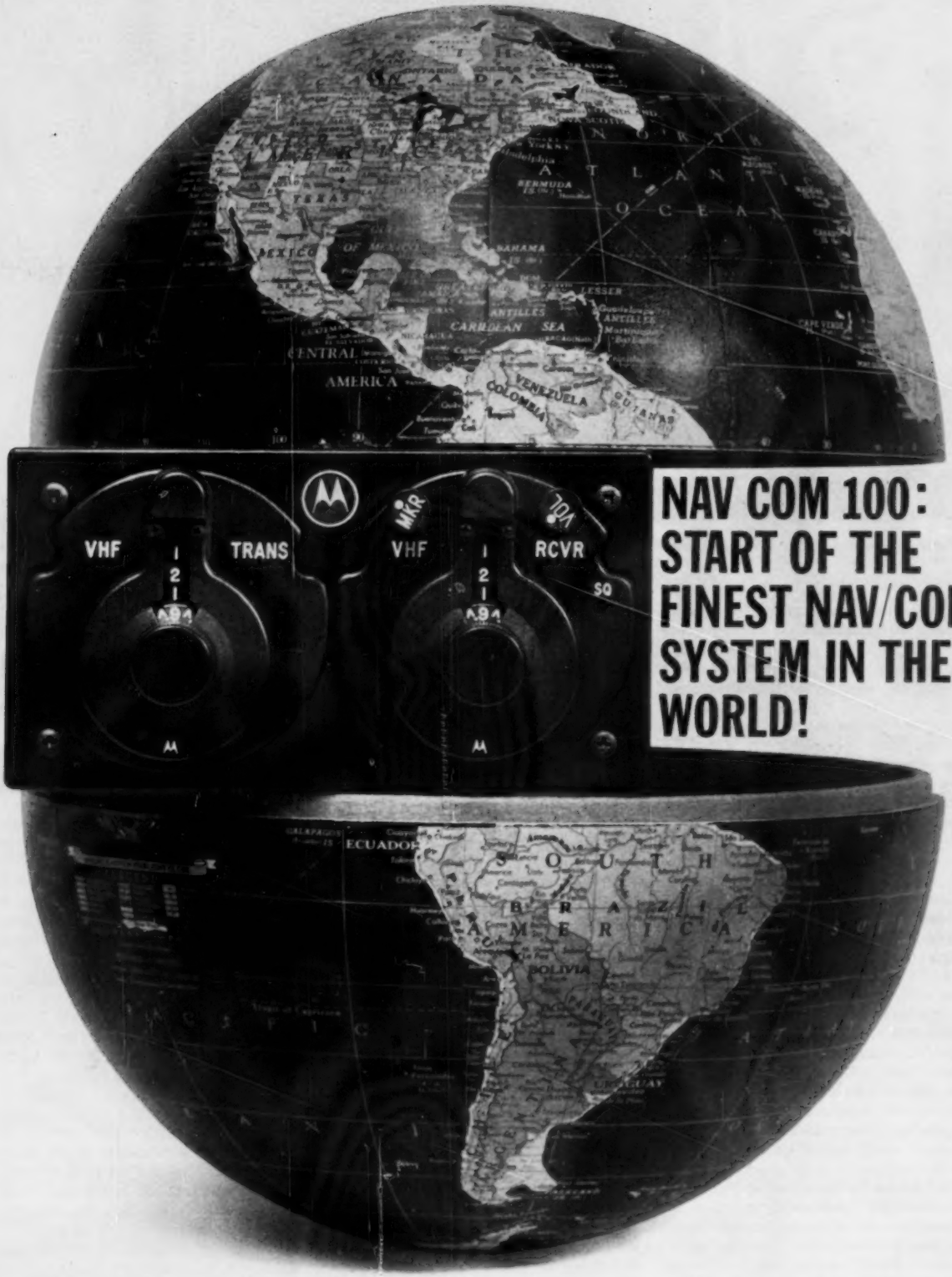
"The most hazardous flying," says Palen Hudgin, "is coming in at those forest fires for a supply-drop at 50 feet. Air currents are terrific—and sometimes the pine trees are sticking up there higher'n you are. That's where fouled spark plugs could hang you on a limb."

The Hudgin brothers use Champion's new REM40E *Foul-Resistant* plugs in their aircraft. With their Tucson airstrip at 2,550 feet altitude and their North Rim airstrip at 8,550 feet—and with all the ups and downs in wind, sand and sun in between—plug-fouling could be a major drawback.

"We operate in wicked extremes of temperature, elevation and elements like fine abrasive sand," Al said, "and, like I told you, our charter planes have some *long* hauls over Mexico and the U. S. But with anti-fouling REM40E's, our engines are completely *dependable*—no plug fouling! The two-prong electrode, longer core nose and bigger bore of the REM40E let combustion gases blast the firing-end *clean!* You don't have lengthy burn-out or last-minute plug changes, either. We pull these at 400 hours—and Herb, they're still good!

"The only problem we have is one Champion can't do anything about—that's the big buck antelope that get curious and chase our planes around the Grand Canyon Airport on occasion . . ."

CHAMPION SPARK PLUG COMPANY
TOLEDO 1, OHIO



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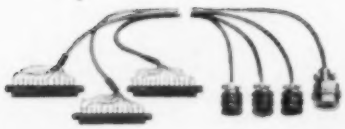


This interconnect cable lets you easily expand your navigation-communication capability starting with Motorola's NAVCOM 100. Simply plug in each additional unit when you're ready. No rewiring, tearing, no cutting.

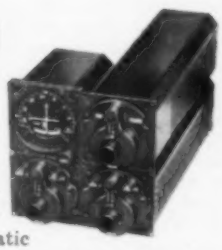
Start with this powerful VHF receiver and transmitter unit (also available in side-by-side mount for standard 6⅛" opening). Transmits up to 280 channels and receives up to 460 channels, with 50 KC. separation capability.

14 volt including Shockmount. $1095

Add on airline-type navigation with complete VOR/LOC capability including 4080 indicator, aural marker beacon receiver, automatic omni and localizer switching.

14 volt including Shockmount. . $400

Add on easy-safe approach equipment with this complete ILS glideslope receiver... 10 channels... automatic glideslope receiver channel selection.



Model 5607D Glideslope Receiver, 4087 Indicator and Shockmount $930

See your local Motorola/Lear dealer for *free booklet*, "HOW TO FLY VOR"...or write: Motorola, 3302 Airport Ave., Santa Monica 4, Calif.

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HAVE YOU READ?

BY JAMES F. SUNDERMAN

DAUGHTER OF THE SKY: THE STORY OF AMELIA EARHART, by Paul L. Briand Jr. (Duell, Sloan and Pearce, 124 E. 30th St., New York 16, N. Y., $3.95).

The name of Amelia Earhart commands prominence in the saga of flight. Others have equalled her accomplishments, surpassed her contributions to aeronautical science. But as a pioneer, adventurer, an embodiment of the airman's spirit and derring-do, she has no peer.

Captain Paul Briand, AF Academy English instructor, writes her biography with a scholar's thoroughness for detail and a writer's gift for meaning and simplicity. The book, a product of years of painstaking research in libraries, archives, private papers, and personal interviews with scores of her associates, draws a compelling portrait of a great flyer.

Briand transcribes A. E.'s life from early girlhood through maturity, college, to a career in aviation which led to personal triumph and nation-wide acclaim. Her fame stems from two factors: she was a woman of many firsts in a field almost exclusively dominated by men; but more important, her grasp was always just beyond her reach. This indomitable spirit of adventure completely possessed her, made her a curious combination of realist-idealist. There is little doubt, as Briand points out, that this characteristic overwhelmed her logic and reason, and led to a recklessness that was courted by sheer luck, beginning with her first near tragic trans-Atlantic flight in 1928 as a passenger in the back seat of the trimotor Fokker, "Friendship."

Amelia Earhart emerged unscathed from numerous aircraft mishaps thereafter, but no single incident could deter the drive, the determination, the search for the unknown.

Luck ran out on her in June 1937 on one of the final legs of her round-the-world flight, beginning the most celebrated enigma of the air age. Briand presents a convincing case of her capture and execution by the Japanese military garrison on Saipan. A final chapter gives a minute-by-minute radio contact recap of the fatal 2,556 mile-long flight from Lae, New Guinea to Howland Island. Testimony of the Lockheed Electra's landing at Saipan, of Amelia's and Fred's seizure by the Japanese is given by Josephine Blanco Akiyama, resident of Saipan at the time.

LET'S GO FLYING, by Martin Caidin (E. P. Dutton, 300 Fourth Ave., New York 10, N. Y., $3.95).

Amateur pilot Caidin in "Let's Go Flying" draws on his own personal experiences in student and licensed flying to create this descriptive, refreshingly lively and profusely illustrated book.

In 12 chapters that are heaped with practical application, from manipulation of controls to radio navigation on the airways, Caidin mixes the romance of flight with the hard facts of knowledge and skill required in the air and on the ground.

Topics covered include flight theory, aircraft construction, engine mechanics, navigation, weather, radio communications, instruments, flight safety, take-off and landing procedure, how to select and purchase a plane of your own.

THE REPORT OF UNIDENTIFIED FLYING OBJECTS, by Edward J. Ruppelt (Doubleday, 575 Madison Ave., New York, N. Y., $3.95).

Amid claims, counter-claims, charges and counter-charges, there is developing a sizeable "flying saucer" literature. Most saucer books are written to confirm the theories of "the believers," or to sway those individuals "on the fence." Few of the volumes flooding the market today approach the subject from a rational, scientific basis.

Ruppelt is one author who does, and his newly revised, updated volume (first out in 1956) is written from a background of personal responsibility as one-time chief of the USAF Project Blue Book, the official agency charged with investigating and analyzing UFO reports. Ruppelt studied more than 4,500 sighting cases with astronomers, physicists, aerodynamic engineers and psychologists. Many cases are analyzed in this volume.

All but a small per cent of sightings made by individuals ranging from crack-pots to highly reliable witnesses, have been identified through scientific analysis as explainable phenomenon. Without a shred of physical or material evidence to date that saucers actually exist, the investigating scientist cannot elect to make educated guesses. He is disciplined otherwise and, until the occasion of actual proof, says Ruppelt (and it hasn't come yet), the great space age controversy, the UFO, will continue.

GERMAN MILITARY AIRCRAFT IN THE SECOND WORLD WAR, edited by Eiichiro Sekigawa (Kantosha Co., Ltd., Tokyo, Japan).

A complete picture-narrative and three-view silhouette coverage of German WW II aircraft compiled by the staff of the Japanese Aviation Magazine "Aireview." Japanese-language edition contains illustrations, accompanied by English-language translation.

THE TALE OF A COMET, by Derek D. Dempster (David McKay, 55 Fifth Ave., New York 3, N. Y., $4.00).

The vivid, well-researched story of the development, test flight and ill-fated operations of the British de Havilland Comet I jet airliner—world pioneer of commercial jet transportation. The book follows the evolution of the Comet from design, through engineering, construction and flight

(Continued on page 18)

FLYING HIGH AT DOWN-TO-EARTH COSTS

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Why is the Mooney Mark 20 the only aircraft with the **efficiency combination** to bring you DOWN-TO-EARTH COSTS?... **ADVANCED ENGINEERING.**

Mooney's efficiency combination can mean first year savings up to $8,380.00 over comparative aircraft. These savings are in a plane with speeds up to 190 MPH and mileage costs as low as 6c per mile. Mooney's **down-to-earth costs** are the end product of **advanced engineering design.**

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COMPARE!

	MOONEY MARK 20 A	BEECH 33	CESSNA 210	PIPER COMANCHE
PERFORMANCE				
Horsepower	4 cyls., 180 h.p.	6 cyls., 225 h.p	6 cyls., 260 h.p.	6 cyls., 250 h.p.
Top Speed	190 mph	195 mph	199 mph	190 mph
Cruise (75% Power)	180 mph	185 mph	190 mph	181 mph
Rate of Climb	1150 fpm	1010 fpm	1300 fpm	1400 fpm
Service Ceiling	20,000 ft.	19,800 ft.	20,700 ft.	20,000 ft.
Range (Max. @ 10,000 Ft. No Reserve)	1110 mi.	1170 mi.	1100 mi.	1100 mi.
Take Off Distance	600 ft.	900 ft.	740 ft.	750 ft.
Landing Distance	550 ft.	570 ft.	520 ft.	650 ft.
ECONOMY				
Initial Cost (Standard Equipment)	$15,450	$19,995	$22,450	$18,995
Factory Eng. Exchange Price	$ 1,532	$ 2,414.84	$ 3,056	$ 2,962
Hourly Gas Consumption (75% Power)	10.8 gph	13.4 gph	15.8 gph	15.6 gph
Total Hourly Operating Cost (300 hrs./yr.)	$17.71	$22.42	$22.31	$25.90
First Year's Operation (300 Hours)				
a Mooney Saves You	→	$1,413.00	$1,380.00	$2,457.00
Initial Cost—Mooney Saves You	→	$4,545.00	$7,000.00	$3,445.00
First Year Total Savings As				
Mooney Mark 20 A Operator	→	$5,958.00	$8,380.00	$5,902.00

"You have to spread out to stay in business these days, and I have logged thousands of miles throughout New England, New York, Pennsylvania and New Jersey in my Mooney Mark 20A. Flying saves time and money. In my Mark 20A I can keep business appointments in other states and be home the same night for dinner."

— CHARLES E. DRAZEN, President
of Drazen Lumber Co., North Haven, Conn.

Mooney AIRCRAFT, INC.
Kerrville, Texas

Have You Read?

(Continued from page 17)

operation, details the inside story of the men who built and flew Comet I to world fame and disaster. The author reconstructs Comet I tragedies, traces the causes and the design corrections reflected in later Comet models now operating on the world airways.

RACING PLANES THAT MADE HISTORY, by David C. Cooke (G. P. Putnam's Sons, 210 Madison Ave., New York 16, N. Y., $2.50).

Here is the fourth in Putnam's great-planes-of-history series designed especially for the young adult, but of interest to all ages. This one traces the history of air racing from the Curtiss "Golden Flyer" pusher biplane (which won the First International Air Meet Race at Reims, France, in 1909 at a speed of 47.65 mph) to the P-51 Mustang, a WWII surplus fighter converted to a racer, which captured the Bendix and the Thompson trophies in 1946; 37 air racers featured here in photo, historical narrative, and design-operational data, are prop-driven and comprise a unique history of the planes, the men and the events which made air racing an outstanding national annual event.

FIND A CAREER IN AVIATION, by Irwin Stambler (G. P. Putnam's Sons, 210 Madison Ave., New York 16, N. Y. $2.75)

Here is a worthwhile guidebook to a career of the future by an aeronautical engineer and editor of "Space Astronautics" magazine.

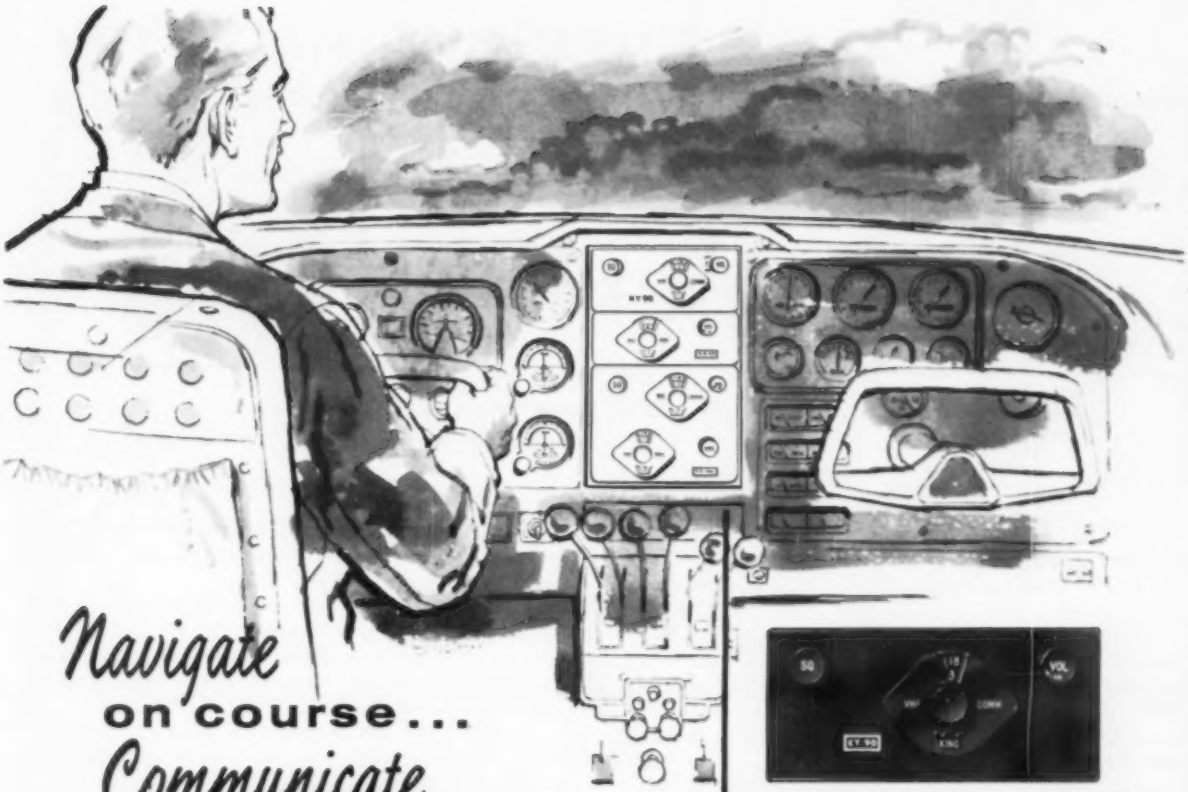
It not only lists the skills, qualifications, training, and prerequisites needed for a career as pilot or aircrew member, but also details scores of other types of occupations in the field of aeronautics and flight operations, pursuits such as meteorology, communications, draftsmen, engineer, sales representatives, etc.

For the young lad about to choose a lifetime pursuit, this small volume describes and evaluates a profession where the future is limitless and it lists how training can begin in the upper grammar school and Junior High grades. Airmen everywhere will be doing a great service to bring this volume to the attention of the younger set.

1960 UNITED STATES AIRCRAFT, MISSILES, AND SPACECRAFT (National Aviation Education Council, 1025 Connecticut Ave., N.W., Washington, D. C., $1.00).

Picture-narrative encyclopedia to all American civil and military aircraft, rockets and missiles and future spacecraft. Excellent reference for schools and libraries.

THEORY OF WING SECTIONS, by Ira H. Abbott, and Albert E. von Doenhoff (Dover Publications, 920 Broadway, New York 10, N. Y., $2.95)—the aerodynamics of wing sections and airfoils. Technical.



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. . . As in the Beginning

GILL ROBB WILSON
Publisher

REVITALIZATION of the National Aeronautics Association, now in planning stages, could be the best of good news. A mission exists and the timing is opportune.

Forty years ago, at this date, the origin of NAA was a concept struggling for birth in the minds of those few Americans who foresaw the implications of the airplane. In 1921, the Association was born and, for several decades, as the parent body of organized aviation in the United States, rendered historic service.

Not alone the thin ranks of the pilots and mechanics but many citizens of great national stature proudly wore the gold and blue (later, silver and blue) wings of NAA –Dwight Morrow, Herbert Hoover, Orville Wright, Newton Baker, Paul Litchfield, Hiram Bingham, Charles Kettering, Tom Beck and scores of others.

Spurred by the promotional and educational efforts of NAA, countless forums, air shows, Congressional briefings, local airport developments and projects ad infinitum took place the length and breadth of the land. NAA was largely instrumental in gaining official recognition for aviation both from a military and civil standpoint. It authored laws, fought for adequate budgets, rewarded men and groups for outstanding service to aviation and represented the United States as a member of the far flung Federation Aeronautique Internationale.

In due time, various phases of aviation began to emerge as having economic potential for private enterprise–the manufacturing industry, airlines, agricultural applicators, pilot and mechanic training schools, business, utility, sportsman and pleasure flying. As the possibility of each phase matured, it went its own way, formed its own trade or service organization and no longer depended upon the parent association. NAA rejoiced in these expansions and sought only to maintain among all the philosophy of co-operation from which all had sprung.

The inevitable result was that NAA stood at last much as the "old homestead" from which all the grown children had departed to make their own way in the world. Except for its continuing representation of the United States in FAI and in promotion of model building, it has of late years been more a memorial to a valiant past than a beacon to a beckoning future. However, here and there a local group of citizens preserved community organization; and at national level a handful of far-sighted people maintained the ancient dignity of the Association in the belief that another major mission would ultimately develop for NAA.

That mission has now become crystal clear. It has two primary areas of pertinence.

One area is to bring intellectual order out of the interminable clashes of the self-interested organizations which today constitute the roster of American aviation. Self interest is wholly worthy and tolerable but run amok it requires the discipline of a knowledgeable and dispassionate monitoring voice.

The best to be hoped for as American aviation stands today is a succession of uneasy compromises, pressure patterns of influence, half truths of recrimination or whole truths lifted from proper context.

Needed sorely, is an articulate voice owing allegiance to none, sympathetic to the reasonable ambitions of all, and motivated solely by what is best for the American people.

The second area of pertinence for a revitalized NAA is composed of those gaps where the interest of aviation trade or service organizations does not or can not reach effectively.

For instance, State Department use of airline franchises in international barter, to the great disadvantage of our own people.

The long history of appointments of unqualified people to aviation administrative positions in government, from which has come the economic confusion of our airline patterns. Of 6,000 airports in America a meagre ten per cent are served by scheduled commerce and in many of these, competition is either a golden calf or a comparative myth.

The lack of an effective youth program in aviation, despite the many angles from which it is vital.

The lack of a national community flight-strip program, which might well be integrated into the national highway development.

Including such evaluations as the freedom of space, the subsidy of local service airlines, the merger of airline systems, nonpartisan appraisal of essential air and space power, there is much to require a fearless and knowing airwise voice in America.

To the new generation of NAA–more power! All it takes is blood, sweat, tears, dedication, wisdom, guile, perseverance, money and prayer–as in the beginning.

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AMERICA'S LEADING AIRLINE

missiles and the airman's world

By W. V. KENNEDY

Top: USAF Snark thunders off its pad. Snark, Atlas, Titan or Minuteman, missiles leave their crews behind on taking off.

Left: Two ways of life are personified by Major Maxwell D. Hinsley, B-47 squadron commander, now Snark senior launch officer.

Opposite page: A B-47E climbs out. Because missiles are readied over and over again, with few launchings, pilots feel let down.

Fine-trained at great cost, the military pilot assigned to a missile unit is faced with an odd and frustrating task. How well he adjusts is a matter of utmost concern. How does he think and feel?

THE AIRMAN'S WORLD, to the publisher of this magazine and to the men for whom he speaks, is one of majesty.

What happens to the vision and the daring that flying has fostered when the pilot can see no farther than the hangar door; when the sky exists only in a black box on a "bird" without a cockpit?

The Snark-equipped Strategic Missile Wing at a certain Atlantic Air Force Base, the first truly operational USAF strategic missile unit, is beginning to find out.

The lessons it is learning apply whether the "bird" in question is the Snark, the Atlas, Titan or Minuteman. All share one major characteristic—when they leave the ground they leave their crews behind.

Gen. Thomas D. White has summed up the problem by comparing static missile units to the old Coast Artillery. What happens to the outlook of men, General White ponders, who spend their days "polishing the butt end of a missile with a blitz cloth?"

From a distance, this particular AFB looks much the same as it has since its World War II beginnings. The only striking change is its silence. Up until a few months ago, interceptor aircraft engines started the day for both base and town with a bed-shaking roar. Now there is nothing louder than the rumble of the morning milk train. The parking apron and taxiways are bare. The hangars are filled with missiles. The flight-line fence, once so definite a boundary, is meaningless.

The non-rated—those who don't fly—are as much the lords of this domain as the rated. Indeed, to the non-rated officer and airman technician, the Snark and the entire missile program do mean fulfillment.

"How do I like this job?" a World War II navigator, long since converted to special weapons, responded. "This is the best job I ever had. It's made to order for a technician."

"This is the first time I've felt my job is as important as an officer's," a staff-sergeant electrician said of Snark. "When I was in a flying outfit officers and crews patted me on the back and took off; from there on the mission was all up to them. Now, the mission depends on me, every step of the way."

It is something of a shock to mount to one of the balconies from which Snark "pre-flight" is controlled and find, amid analyzers and computers, an officer who bears all the marks and mannerisms of a pilot, even to a pair of black flying boots. The effect is much the same as that produced by the strangely quiet airfield.

Apparently, this feeling was heavy on the mind of an F-100 pilot now assigned as a Snark launch officer. "This never-ending preparation," he said, "without any sort of flight is frustration. I was forced out of fighters and into the missile business. I hate it."

"But," I asked, "wouldn't the contraction of fighter aviation have forced you into missiles eventually?"

"I'll take that into consideration," he replied, "when the last fighter squadron is deactivated and the last fighter thrown on the junk heap."

"Would it make any difference if you were working with Atlas or Titan?" the base information officer asked.

"No," the pilot replied, "I hate 'em all."

"And what," I asked, "if you never can fly the fighters again?"

"Then, you can bet, I'll get the hell out, Regular commission and all." (*Continued on page 72*)

BAROID'S air fleet

Thirteen planes on wheels, floats, skis, fly over 6,500 hours a year to service company's activities in its far-flung petroleum operations.

By PIERCE SHANNON

Right: One of two Aero Commanders, at Andrau Airpark, west of Houston, with Bill Miller, *left*, director of flight operations, and company pilot John Hewett. *Below:* A Baroid floatplane base on Industrial Canal, New Orleans.

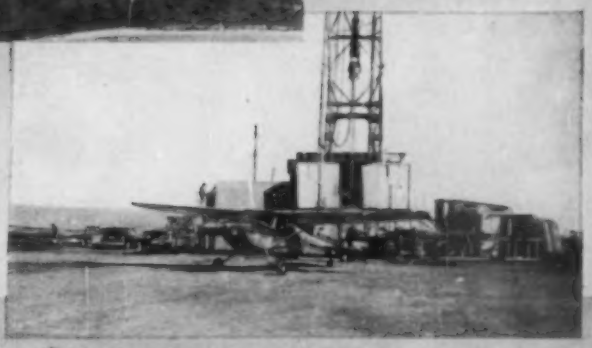
Recently, an oil-well rig drilling below 13,000 feet in the Texas Panhandle became stuck. The drill pipe plugged up, preventing the pumping in of the usual weighted muds to offset the pressure. Pump pressures built up to 5,000 pounds per square inch, the tested capacity of the Kelly hose through which the mud is pumped into the drill pipe.

Veterans on the rig knew the danger. If the Kelly hose gave way, the well would blow out, endangering a million dollars worth of drilling equipment, plus 13,000 feet of hole at $10 or more per foot in actual cost.

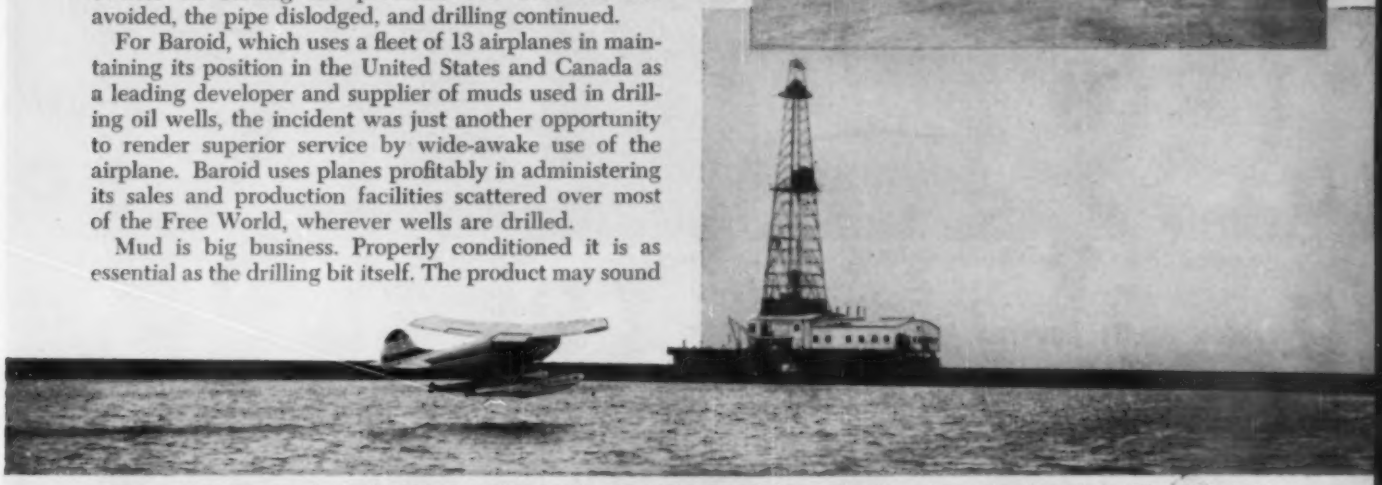
Within 30 minutes after a quick call from their first expert on the scene, a laboratory official from Baroid Division of National Lead Company was in a company plane headed for the Panhandle. One of the nation's leading authorities on controlling high pressures, he was on the rig floor two and a half hours later, advising the owners on solving the problem. The blow-out was avoided, the pipe dislodged, and drilling continued.

For Baroid, which uses a fleet of 13 airplanes in maintaining its position in the United States and Canada as a leading developer and supplier of muds used in drilling oil wells, the incident was just another opportunity to render superior service by wide-awake use of the airplane. Baroid uses planes profitably in administering its sales and production facilities scattered over most of the Free World, wherever wells are drilled.

Mud is big business. Properly conditioned it is as essential as the drilling bit itself. The product may sound



oft: Ranging 200 miles around their bases, Cessna floatplanes enable engineers to make 15 to 20 calls a day. *Below:* Rigs in hard-to-reach locations get better, faster service by planes.



Company pilot-engineer lands alongside rig working in a Louisiana lake. Aircraft have reduced travel time from hours to as little as 20 minutes.

prosaic but the business is exciting and colorful, keeping a varied fleet of airplanes at work. On floats, skis and wheels, Baroid's miniature air force keeps life interesting for the company pilots.

Reduced to simple language, drilling mud is circulated through the well by pumping it down the inside of the hollow drill stem, out through holes in the drill bit and back to the surface through the annular space between the outside of the drill pipe and the wall of the hole. The returning mud carries the drilled formation cuttings out of the hole to the surface where they are screened out. Various chemicals and solids are added to the mud to control its physical and chemical properties as it moves through the surface pits to the pump for continuous recycling through the well. Properly conditioned mud is as essential as the drilling bit itself.

Baroid service engineers are skilled at designing mud programs for specific conditions that may vary from well to well. A part of their service is the supervision of the mud program during drilling of the well. Frequent trips, in some cases daily, are made to the rig. The company also maintains a logging service which gives the customer data about formations being drilled and detects the presence of any oil or gas that might "show" in the mud of cuttings out of the well.

George B. Coale, vice-president of National Lead and general manager of Baroid, puts the finger on service as being the essence of sales success in his particular field. And he maintains that better and faster service to customers made possible by using planes has been a big factor in his company's continued marketing drive, even in the face of increasing competition.

The aviation section was born from a necessity to provide better and faster customer service. During the upsurge in drilling activity following the end of World War II, Baroid engineers faced what seemed to be the impossible task of maintaining service for rigs, scattered not only over a wide area but also drilling on locations deep in the marshes, inlets, bays and lakes along the Gulf Coast where proper mud programs were mandatory because of high pressures encountered.

Initially, many man-killing hours were required even to travel short distances. "To reach many of our rigs," explained J. W. "Tiger" Hood, "it was necessary to drive perhaps a hundred miles to the marine base of operations for the company doing the drilling. There we caught a company crew or supply boat and traveled another two or three hours to the rig. As a result we were limited most of the time to making one or, if we were fortunate, two rigs a day. Usually, we averaged not over one hour actually working at each rig."

Hood, who is now assistant (*Continued on page* 66)

New look of 200-mph-plus Aero Commander 500A is keyed to the airfoil-shaped nacelles that reduce drag 12 per cent, adding to performance.

CHECK PILOT REPORT

aero commander 500A

Impressions of a single-engine pilot transitioning in Aero Design & Engineering's new, executive twin.

What are the impressions of a rated single-engine pilot making his transition to a multi-engine airplane? What are his reactions to engine-out procedures, single-engine stall conditions and increased flying speeds?

FLYING *asked single-engine pilot Basil Deltour, whose multi-engine experience has been limited to observer time in light twins, to fly the first and lowest priced of Aero Design and Engineering's new Commander line. His report follows.*

FLYING a new airplane is bound to stimulate the enthusiasm of any pilot. My enthusiasm, after transitioning in the left seat of the new Aero Commander 500A, stems from this basic factor: the airplane is not difficult to fly and should create no problems for the "non-professional" corporate or business pilot.

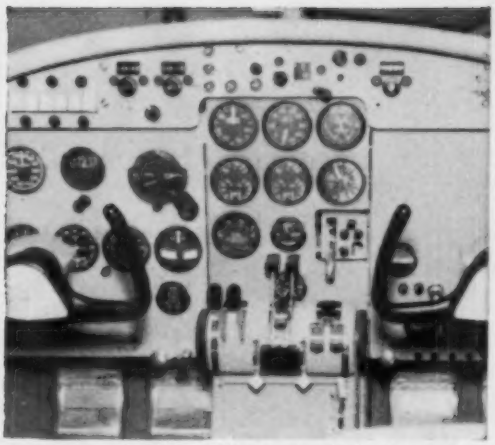
Performance of the six- to seven-place light twin is keyed to the extensive design and configuration changes, including fuel-injection engines, that Aero Design & Engineering Co. has worked into its new line of corporate aircraft.

Stability of the 560A during slow flight is good. Engine-out and stall characteristics are not critical. The airplane met or exceeded the manufacturer's specifications in all phases checked.

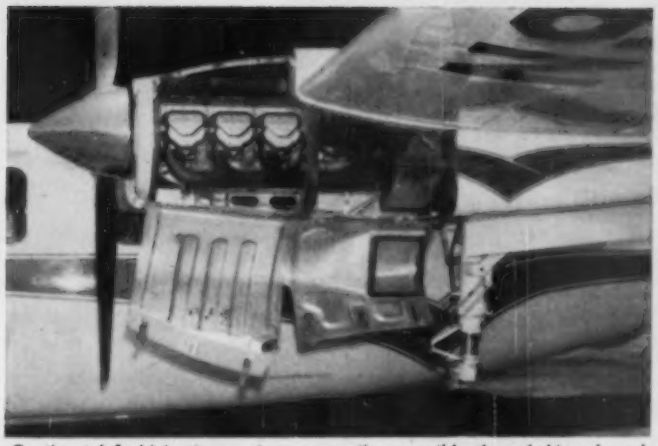
Right here I'd like to state flatly that I'm not a rated twin-engine pilot. In writing this pilot report I hope to spotlight some of the impressions of a single-engine pilot making his early transition to a twin.

The 200-mph-plus Commander 500A is powered by two Continental IO-470-M fuel-injection engines, each generating 260 bhp at 2,625 rpm. The two-bladed Hartzell propellers are of 80 inches maximum and minimum diameter. Range, at 45 per cent power with 30 minutes fuel reserve, is 1,800 miles. Service ceiling is 23,500 feet. Empty weight is 4,075 pounds and maximum gross is 6,000 pounds.

Basic cost of the 500A is $72,000. Commanders are built to order and Aero Design already has sold this year's production, amounting to over 100 aircraft, of the 500A and the 500B, 560F, 680F and the pressurized



Standard panel of the 500A includes flight instruments, left, engine instruments centered. Switches are overhead.



Continental fuel-injection engines are easily accessible through hinged cowling doors. Exhaust gasses vent over top of nacelle, reducing noise level.

Main gear wheels rotate 90 degrees during retraction following take-off. Raised nacelles allow added visibility.

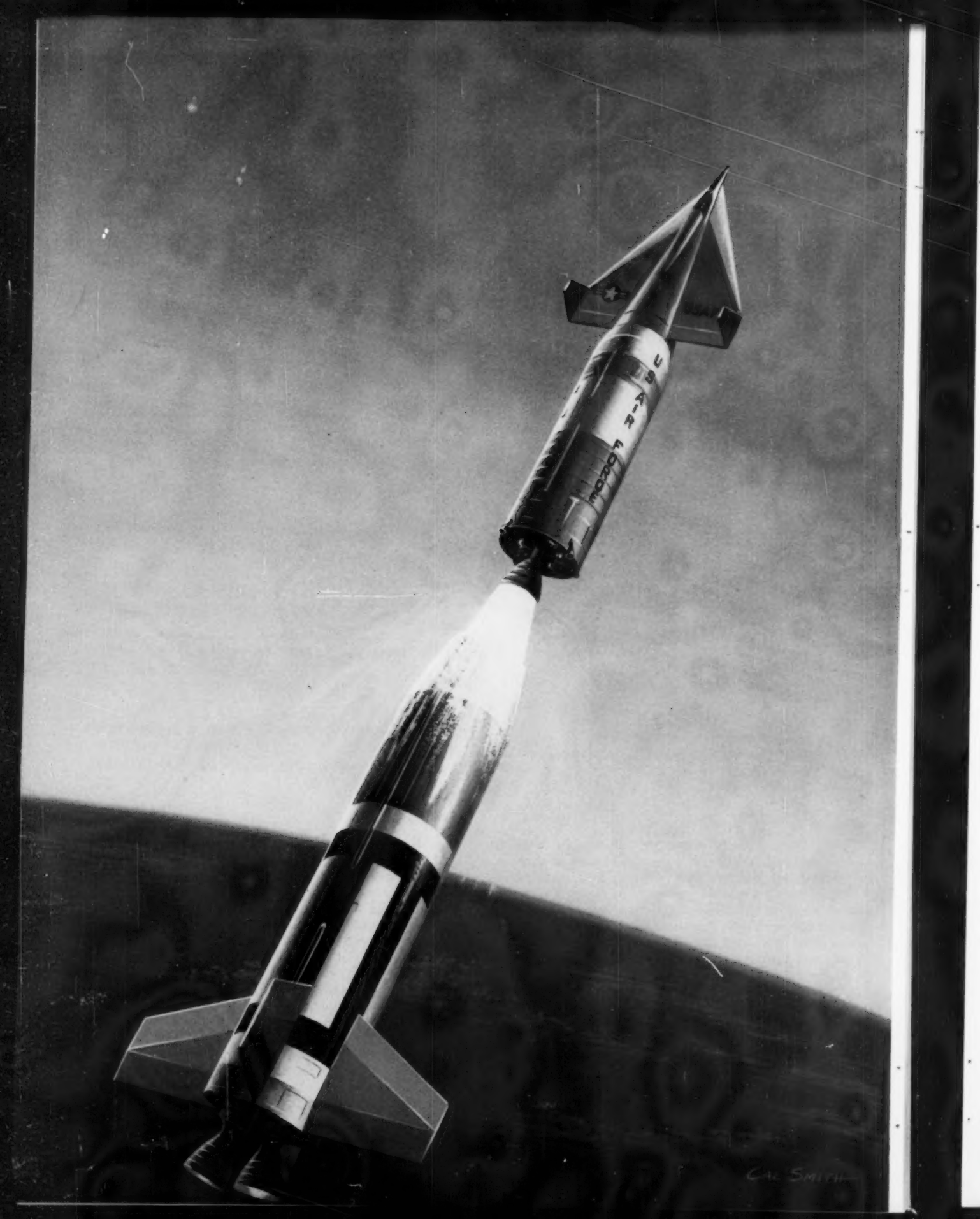
720A. Plant capacity is currently 18 aircraft monthly, with deliveries running five months from time of order.

The smart looking 500A, with its new, flat, airfoil-shaped nacelles, has the powerplants raised 4.15 inches over previous installations. This increases propeller tip clearance with the fuselage. The demonstrator was equipped with four passenger seats, window curtains, pilot compartment curtains, 156-gallon fuel capacity, as standard items. All radio equipment is optional.

If it were not for the two-bladed propellers you'd have to look close before you could distinguish it from one of the more powerful Aero Commanders. This is understandable as all the airplanes are identical in structure, bulkhead for bulkhead, rivet for rivet. The only differences are the engines and interiors, with more instrumentation in the heavier models. Though the gross weight of the 500A is 6,000 pounds, it can be loaded up to the maximum structure gross weight of 8,000 pounds.

The "Speed Line" nacelles, as Aero Design has designated them, also have raised the bottom of the nacelle nine inches. With the propeller tips two inches farther from the ground there is even less chance for blade damage due to stones on gravel runways. Raising the bottom of the nacelle results in considerable improvement in passenger visibility which I was able to verify in flight. Even busy executives enjoy looking out of the windows at times!

The exhaust augmenter tubes, long a source of complaint because of noise, have been deleted in favor of a system that vents the exhaust gases over the top of the nacelle where electrically operated cowl flaps have been added. The airplane now is considerably quieter, both inside and out. The cowl flaps might well have been omitted as on this warm California day they were never opened, even on prolonged single-engine climbs, and I never saw the cylinder-head temperatures advance beyond the middle of the green arc on the gauge. To avoid excessive cooling, 60 per cent (*Continued on page* 75)


U.S. AIR FORCE

dyna-soar the hypersonic space glider

THE PROTOTYPE OF THE FIRST SPACE WEAPONS SYSTEM WILL FLY BY 1964.

By JAMES J. HAGGERTY JR.

The performance curve of military flying equipment, which has been in fantastic ascendancy since World War II, is about to climb several more notches on the graph.

Military researchers now are taking a hard look at the next step beyond the long-range ballistic missile—space weaponry, manned and unmanned vehicles which will operate outside the atmosphere and do their job of destruction either in space or on the surface of the earth.

The Air Force has let a number of "feasibility-study" contracts for space weapons systems, "way-out-in-the-blue" projects at which even Jules Verne might have scoffed. They involve such concepts as controllable orbiting hydrogen bombs, manned hypersonic bombers circling the earth every 90 minutes, manned space interceptors capable of destroying intercontinental ballistic missiles or neutralizing enemy orbiting bombs, and space transport craft for the resupply of large military space stations.

Pretty wild? Not so, say the people closest to these studies. Although the feasibility studies are still in progress, early indications are that some of these incredible concepts will bear fruit within the decade. The prototype of the first real space weapons system is already under way and it will fly in 1964.

This forerunner project, the Wright Flyer of the military space age, is called Dyna-Soar, a corruption of "dynamic soaring." The prototype version is not intended to be a military vehicle. It is purely a research project, designed to investigate in actual flight some of the theoretical ideas under study. It has been given the green light for hardware construction, the basic design has been completed, and the companies charged with airframe and rocket booster responsibility are already at work on their portions of the program. Contracts soon will be let for the multitude of complex sub-systems which will go into the vehicle.

Opposite page: Delta-wing Dyna-Soar and its upper-stage booster separate from the lower-stage which, like the upper, is adopted from the Martin Titan.

Dyna-Soar, as the name implies, is a glider. It will be blasted into space by a powerful rocket booster to coast around the earth on its own momentum.

There are three phases to the Dyna-Soar project. Phase I is the active phase for which funds have been provided. It calls for a "suborbital" vehicle, that is, one which will not have sufficient velocity to neutralize gravity and stay in space orbit. Instead, it will coast on its own momentum several times around the earth, and, with aerodynamic controls, spiral down to a landing on the earth.

Phases II and III are still in the study stage. Phase II calls for an orbital vehicle which can stay aloft indefinitely and re-enter the atmosphere at will with the aid of retro-rockets. Phase III is the "weapons system application," in which the research vehicle will be converted to a manned military bomber or interceptor.

Responsibility for the conduct of this program is shared by several agencies. The Boeing Airplane Co. has been named systems (*Continued on page* 64)

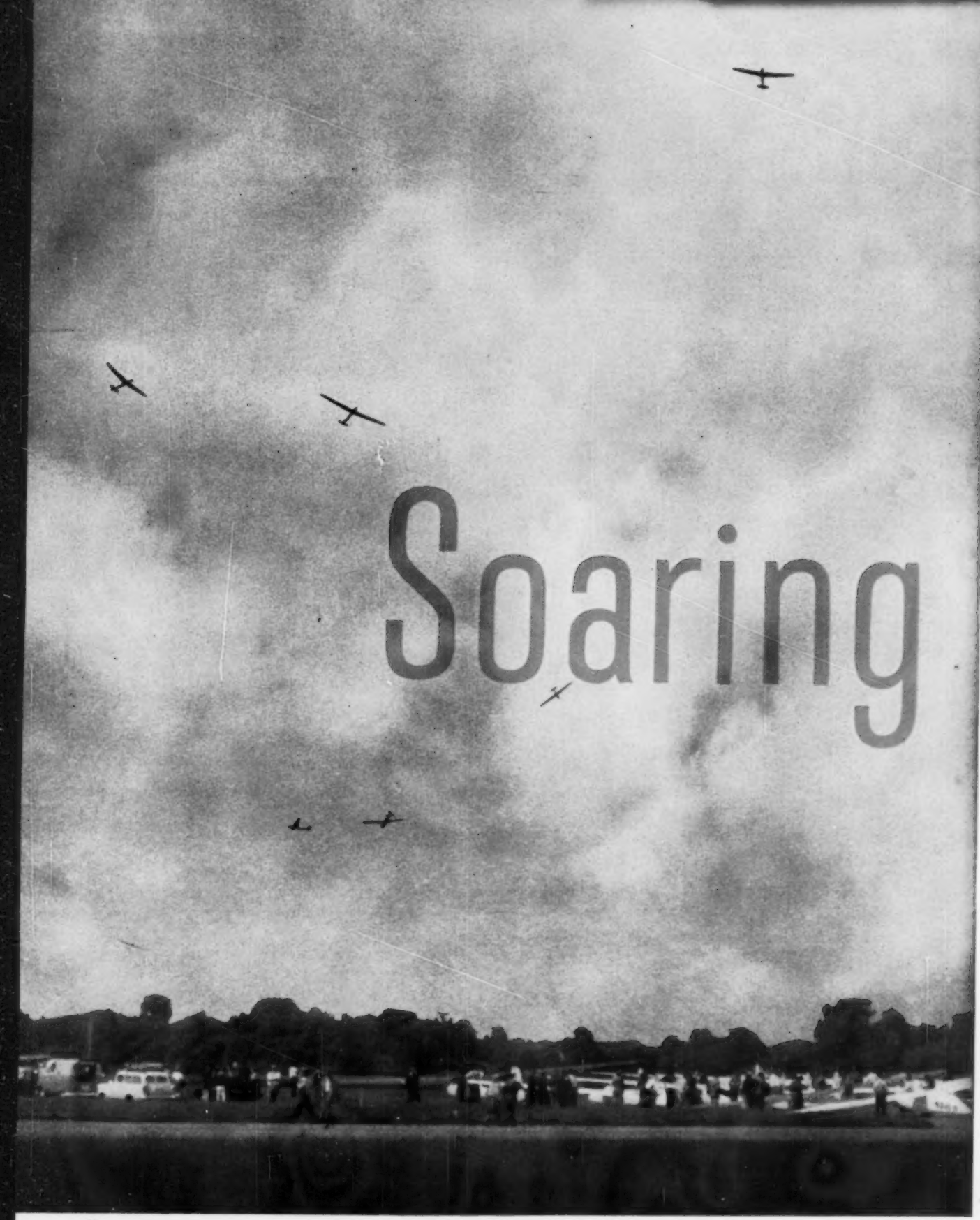
With periscopic view from wing low flown
how oft I've sought earth's secrets for my own
and marveled at the whole of which I'm part
suspended for uncertain interlude by just
the turbined thrusting of my heart.

Who knows a kinship with the mother earth
is undismayed to contemplate the truth that
dust is dust and dust to dust returns when
some faint wind blows out the flame so that
the candled wick no longer burns.

Think not the astronomical in time or space
essential to the glimpsing of His face whose
authorship demands no vasty cosmic pen to make
the truth stand clear revealed that He is God
alike to worlds and men.

The very dust is life! Give o'er thy troubled
mind to be at one with sun and wind and flaming
copse and greening sod and waters quiet 'neath
the nurturing hill for all beneath thy low flown
wing is tangible of God.

GILL ROBB WILSON


Soaring

Members of U. S. team, *left to right, front row:* Paul Schweizer, team captain; Dave McNay, Mrs. Richard Schreder, Mrs. Richard Johnson. *Second row:* Irving Prue; John Ryan; John Boone; Paul Bikle, pilot; Richard Schreder, pilot; Richard Johnson, pilot. *Back row:* Andrew J. Smith, without cap; John Graves, team manager; William Coverdale; Herman Stiglemeier; Bernard Wiggin, Meteorologist; Alex Dawydoff. Note special uniforms worn by the team.

olympics

AVIATION'S ONLY INTERNATIONAL CLASSIC ATTRACTS SOARING EXPERTS OF ALL NATIONS WHO VIE FOR THE TITLE OF WORLD SOARING CHAMPION.

By ALEX DAWYDOFF

EVERY SPORT, in order to gain recognition and survive, must engage in competitive activity. Local and regional contests keep participants keen, but the degree of sharpness can be judged best when competition is on an international basis, with a team pitted against the world's best sportsmen and in unfamiliar surroundings. The Olympic games are an outstanding example of such a competitive event; International Tennis Matches and International Horse Show are others, to mention a few.

In aviation, the World Soaring Championships is the only contest of truly international scope, drawing entries from practically every nation.

The Championships are held every two years in the

Ernest Gunther Haase and Dick Johnson.

Small frontal area of Polish sailplanes was achieved by seating pilots in reclining position. *Left,* Standard Foka; *right,* Open Class Zefir.

Dick Schreder in HP-8 talks it over with Bill Coverdale, Paul Schweizer and John Boone.

In center, Paul Bikle, Standard Class pilot, with his all-metal Schweizer 1-23H-15.

Mahogany Bomber. Dick Johnson's RHJ-6 Adastra displays its unusual empennage.

Bearded gentleman is Tony Goodhart of Great Britain who flew a Standard Class Skylark II. With him is team captain Anne Welsh.

country whose citizen won the crown at the previous contest. This year, the host nation was the German Federal Republic (West Germany) because the World Soaring Championship, was won in 1958 by the German pilot, Ernest Gunther Haase, at Leszno, Poland. The meet was sponsored by the German Aero Club and held from June 4th through June 17th at Butzweilerhof airport, four miles northwest of Cologne.

Twenty-four countries were represented at Butzweiler by 55 of their best soaring pilots, with a like number of sailplanes. Originally, 27 nations expressed desire to participate but, at the last moment, Soviet Russia pulled out, claiming that the competition had an aura of military sponsorship because Butzweiler is a military base, jointly operated by the British RAF and the Belgian Air Force; in addition, the 25 Dornier Do. 27 towplanes, used for launching gliders, were loaned by the German Luftwaffe and Army. (It would have been impossible for the championship sponsors to supply this number of tugs from civilian sources.) The two satellites, Czechoslovakia and Hungary, followed suit, but Poland stayed in, confident that the quality of its pilots and equipment was of highly competitive caliber, as good if not better than that of other participating countries. Subsequent events proved the correctness of Poland's assumption. Her team came close to winning the contest in a display of the most sophisticated soaring technique and performance ever witnessed at World Soaring Championships.

The contest consisted of two class competitions, Standard and Open. In Standard Class, certain limitations are imposed on the sailplanes: they must have a wing span of 15 meters (49.25 feet), cannot have flaps or camber-changing devices, radio installations are not permitted and they must be (*Continued on page* 54)

Below extreme left: The three Polish sailplanes in their protective mittens. *Center:* All fiberglass Phoenix 2, flown by Ernest Gunther Haase. *Right:* Ka.6Br, flown by Miguel Ara of Spain.

any town can have an airport... and should

It doesn't cost much to get on the air map—far less than a single mile of paved highway.

By WILLIAM T. PIPER
President, Piper Aircraft Corporation

THE JET AGE is having a curious effect on the development of our nation's aviation picture. The bigger, faster jets coming into service are leaving the smaller communities farther than ever away from their benefits. These big expensive airplanes, with large seating capacity, are of necessity long-range machines. They must operate at high altitudes over long trip lengths to make their operation economical and practical. The smaller towns and cities inevitably must be bypassed by the jet age.

Of course, we must not overlook the increasing service rendered by the local service carriers; but, here again, we are seeing a trend toward larger turboprop aircraft with higher seating capacity and, again, a trend to serve the larger traffic-generating cities. Our own town of Lock Haven, Pa., after having scheduled airline service for seven years, is not now on any airline schedule. Train service is almost negligible. In an automobile it is a six-hour drive to any of our nearby major cities—New York, Pittsburgh, Washington. Fortunately, we can use the personal airplane, and make the trip to any of these places in about an hour.

The possibility of local airline service, at best, affects only a small portion of America's towns and smaller cities. This is evidenced by the fact that there are 6,000 communities served by airports and less than 600 served by airlines. That's less than ten per cent. The smaller town or city which waits to get on the airline map has a long time to wait . . . if ever. In the meantime, the community which is without (*Continued on page 80*)

William T. Piper poses with Comanches at Lock Haven, Pa.

PART III

CONVAIR

INDUSTRIAL GIANT OF THE AIR AGE

By GILL ROBB WILSON

THERE HAVE BEEN no successful accidents in the genealogy of airpower. The engineering which has lifted one aircraft to character above its rivals, or in successive steps up the ladder of its own modifications, is always traceable to a background of ceaseless research.

The putting together of the great aircraft companies so that each represented breadth of creative imagination, penetration of design possibilities, and smoothly working co-operation of engineering and management has given the United States its foundations of air supremacy.

For this reason our tale of Convair thus far, after outlining the company as it stands today, has dealt mainly with ancestral beginnings, merging of lines of experience and pertinent personalities.

There will be future mergings down the line in the interest of greater economic stability but now the historic results in terms of notable aircraft will begin to come into focus—the PBY family of flying boats; the strategic bombers, B-24, B-36, B-58; the civil transports, Convair 240, 340, 440 and the jet 600 and 880; the ICBM Atlas, a 9,000-mile atomic rifle; the guided missile, Terrier, and its related family of defense weapons; and, of course, the pilot-manned missiles, the delta-wing interceptors, F-102 and F-106.

None of these would have evolved apart from the context of their corporate background, a background created from infinite minutia by patient and farsighted management.

Technical advances in aviation up to 1930 had been painstakingly slow. Each step had been without precedent—the radial aircooled engine, supercharging, metal propellers, Oleo landing gear, monocoque fuselage construction. The design concept of the monoplane had won out over the biplane concept only after a considerable conflict in aerodynamic and structural theory.

Due to the lack of aircraft attitude instrumentation, all of us in the early days had to depend on visual outside-the-cockpit reference for aircraft control. This had imposed unendurable limitations in night flight and in weather. Then the gyro compass and aircraft-attitude indicators based on the gyroscopic principle had been evolved. We had to learn to fly all over again; and, oh, it was a chore to relocate one's faith from the seat of the pants to the dials on the instrument panel. I can tell you it took more than faith the size of a mustard seed. And it took more than a little doing also to shed the familiarity of the open cockpit and cocoon one's self in the closed cabin. It even seemed strange to use wheel brakes after years of acquired skill in spot landing. Many a pilot stood many an aircraft on its nose, suddenly remembering that he had brakes, and spasmodically tramping down on them.

And to believe those radio ranges! That was perhaps hardest of all, without a peek. The old iron compass seemed so much more reassuring, despite the tunnels.

Pilots, however, somehow had adapted this sundry progress to their ends. They had crossed the continent nonstop; spanned the North Atlantic; probed the Pacific to Hawaii and skirted it via the Aleutians to the Orient. The poles had been overflown and the earth roughly circumnavigated. Ceilings had been pushed upwards

PBY-5A Catalina

BT-13 Valiant

PB2Y-3 Coronado

B-24 Liberator

of 40,000 feet. Now the stage was set for the decade of the Thirties, the decade that would end with all major European nations again at war, the decade in which the term "airpower" would be coined.

As a prelude of the vast storms later to mature on the international horizon there was an economic squall line for the American aircraft industry to navigate, the great depression. For Consolidated, the most trying of times came in 1932 when less than 100 aircraft were sold, down from more than 300 sold in 1930. Staff was reduced, salaries cut, dividends passed up.

Many corporations were to go under. Many others merged. The wheels of all industry ground almost to a stop.

TWO sales projects came to the rescue of Consolidated. One was an aggregate foreign order for 60 trainers and the other a Navy order for 25 P2Y-1 flying boats which old airmen will recall as the model with the lower sesquiwing, a redesign of the XPY-1.

World interest in flying boat operation had been stimulated when Mussolini's great Air Marshal Italo Balbo led a squadron of 24 Savoia-Marchetti boats across the South Atlantic and on other long-range missions. In the autumn of 1933, the U. S. Navy countered the Italian feat with its first contingent of Consolidated P2Ys. Lieut. Comdr. Knefler McGinnis led Patrol Squadron 10 nonstop from Norfolk to the Canal Zone, thence to San Diego via Acapulco, Mexico and, ultimately, in January, 1934, from San Francisco to Honolulu. Meantime, modification of the P2Y-1 saw the engines faired into the wing, and models P2Y-2 and -3 gave greatly improved performance. Navy doubled its original order, and gave Consolidated a modification contract for the P2Y-1s. Additional foreign orders for the P2Y-3 brought the company's flying boat history up to 71 units sold.

This preponderance of aquatic aircraft production highlighted Consolidated's disadvantageous location at Buffalo where winter ice on the lake made testing a problem. Decision was made in 1933-34 to move the company to San Diego.

This was an unprecedented task involving transcontinental transfer of 71 carloads of physical equipment; choice of engineering personnel whose moving expenses would be paid; financing of a completely modern facility in California; training of a new work force at San Diego; arranging for delay in contract orders and an innumerable number of lesser details, not least of which was the breaking of ten-year ties with the Buffalo community.

Furthermore, not even all key executives of Consolidated wished to make the move. Larry Bell, vice-president and general manager, resigned, as did Ray Whitman, his assistant, and project engineer Robert Wood. Bell took over the old Consolidated plant and incorporated as Bell Aircraft. Whitman and Wood remained with him, along with many other employees. Their first job was a subcontract to make wing panels for the P2Y-3 boats.

By October, 1935, Consolidated's San Diego plant facility of 247,000 square feet was in operation with almost 900 employees on the payroll, a roster which President Fleet predicted would more than treble within a year.

Nor was this a vain boast, since in the interim, the chief engineer, Laddon, had designed the famed PBY (Catalina), an airplane of destiny. Navy, judging that here at last was the answer to its patrol problems, ordered 60 PBYs.

FOR those unfamiliar with the "Cats," a listing of innovations may be interesting. The boat was a monoplane, broad of chord. Wing floats which retracted in flight to form wing tips, gave added lift. The plane was further made "clean" by an absence of external tail bracing and employment of but a single pair of lift struts on either side of the fuselage. Integral wing tanks contributed to weight saving and added range to the PBY. Engine exhaust gasses were internally ducted to the leading edges of wings and tail to combat icing. Knefler McGinnis hopped a PBY nonstop from the Canal Zone to San Francisco, 3,450 miles. Thereafter, mass flights of Cats roamed the Pacific at will and Navy indeed had "eyes."

On the strength of the PBYs, Consolidated more than doubled its plant space at San Diego, and secured working capital by an issue of preferred stock, some 23,000 shares at $50 per share.

First of the Catalinas sold to the civil market was to end up in Soviet hands. Originally, it was purchased to conduct exploration for the American Museum of Natural History. Dr. Richard Archbold, sponsoring the project, named his PBY the "Guba," an aborigine word connoting "squall." In early summer of 1937, the "Guba" made the first transcontinental crossing of the U. S. by a flying boat. During that summer, the Soviet pilot Boris Levaneskay and his crew had been lost on an attempted transpolar flight and the Kremlin, after fruitless efforts of its own, had employed Sir Hubert Wilkins to conduct a search. In a humane gesture, Dr. Archbold sold the "Guba" to the Soviet. Wilkins, operating out of Aklavik, flew her in a single month some 20,000 miles searching for Levaneskay, but without avail, after which the Russians took the plane home to Moscow.

MEANWHILE, Consolidated had built Archbold another "Guba," which, from the spring of 1938 to spring of 1939, traversed the Pacific and made innumerable aerial reconnaissances throughout the New Guinea area. Later, Archbold surveyed Indian Ocean air routes for the British Empire, all the way from Australia to the West African Coast. Thereafter, homebound, the "Guba" crossed Africa, the South Atlantic and the American continent to San Diego, first circumnavigation of the globe along the equator. The "Guba" was subsequently sold to the British government and spent the war years as a unit of British Overseas Airways.

The career of this aircraft is noted because she set new standards of range and durability in shrinking the globe, and symbolizes the character of the more than 2,000 sister PBYs which Convair ultimately produced for the defense of the Free World.

Naturally, it would be impossible to follow the prowling Cats through the long war years—and they were long years for the PBY—since, prior to U. S. entry of the conflict, Consolidated's flying boat was in the thick of combat with British Coastal Command. It was a British Cat, for example, which on May 26, 1941, located and attacked the German battleship Bismarck, meanwhile calling the Royal Navy which destroyed Bismarck on the following day.

B-32 Dominator

Vengeance A-31

XB-46 medium bomber

XP-81 escort fighter

It was a Cat which at dawn, December 7, 1941, saw the Japanese midget submarine at the entrance to Pearl Harbor and marked her for destruction by the destroyer Ward, thus inaugurating naval action in the Pacific. It was a patrol wing of Cats (PAT Wing 10) which lost 25 of its 28 aircraft battling the initial Japanese invasion of the Philippines and evacuating vital remnants to Australia. Cats uncovered the Japanese fleet deployment prior to the decisive Battle of Midway. It was a patrol wing of Cats (PAT Wing 4) which discovered the Japanese invasion of the Aleutians and fought establishment of their beachheads in that bleakest of all flying weather.

THE reader will understand, however, that although hundreds of PBYs were in combat with gunfire, bombs and torpedoes, the greater function of the aircraft was in long-range reconnaissance, logistic support and, above all, in search and rescue. She had legs and she was probably the toughest aircraft in the war. It is no idle evaluation to suggest that the Cats did more to support morale in the Pacific than any other single aircraft. You might be down anywhere in the interminable reaches of the watery wilderness but you were never out as long as a Cat was still looking for you. And that's what everybody needed for combat flying in the Pacific—reassurance that one wouldn't be abandoned in case of ditching.

Perhaps it's a little difficult for the writer to be dispassionate about this PBY category since in my desk drawer are 18 months worth of Cat history—1,500 hours of Cat flying from Pearl Harbor to the bitter end off Perth, Australia; letters home from Joe, namesake of his Uncle Joe, my kid brother of the Lafayette Escadrille, who didn't get back either, as is the way of war with the first thin lines which prepare the groundwork of eventual victory.

In the Atlantic, the most notable service of the PBY was in antisubmarine operation. Ranging from the Arctic to far below the equator on both sides of the ocean, the Consolidated boat, equipped with magnetic airborne detectors, battled the undersea menace, escorted convoys, patrolled against raiders, supported the fleets and carried out a myriad of special missions. Almost every allied government in the war operated its contingent of PBYs.

But now we must get back to San Diego. Despite the PBY program, Consolidated had only 6,000 employees as the decade of the Forties approached the calendar. In international evaluation, the United States at this point was no better than a fifth- or sixth-rate airpower. At our annual NAA convention in 1939, at St. Louis, Maj. Gen. Frank Andrews of the Army Air Corps had railed against U. S. lethargy and we subsequently had staged a drive to awaken the country, most especially Congress. Just the year before, an economy move in the Senate had proposed to cut the maintenance budget for the airways. Fighting the move, I had called upon 37 senators in one day. When the matter came to a vote, the item was not deleted from the budget, and Senator Adams said his struggle for economy in this respect had been defeated by a mere one-man lobby. He shook his fist at me in the gallery. Actually, I had done nothing but inform the various senators that no airway budget, no more air mail and no way home but to ride the rails. The incident was a triviality, but it illustrates the attitude of the country toward aviation at the time. We had gotten some defense airports built by virtue of the fact that WPA was hard put to find constructive projects, but the aircraft industry was so low on the totem pole that it didn't dare raise its voice, even in that respect. And when we had first taken the proposal for a Civil Pilot Training Program to Franklin Roosevelt, recommending initial training of 10,000 pilots and 100,000 mechanics, he had laughed and said the country would think he was crazy if he went along with such an idea.

SO NOW, in May, 1940, the White House called for an annual aircraft production of 50,000 planes! And the aircraft industry said "Yes," because in the interim, every man jack of them had expanded either to serve ourselves or to meet foreign orders for the desperately struggling combatants in Europe.

Thus, it befell that Pearl Harbor Day found Consolidated with 30,000 employees, a figure that was to expand to more than 100,000 within the next two years. San Diego could provide no such force. Consolidated set up tremendous satellite operations at Willow Run, Mich., at Fort Worth, Tex., in Arizona, and in Pennsylvania; and had literally thousands of subcontractors.

BEFORE proceeding further with operational history, here let us trace briefly the final chain of corporate dealings which emerged with Convair as a division of General Dynamics. The chain is somewhat complicated, but we will detail it as simply as possible.

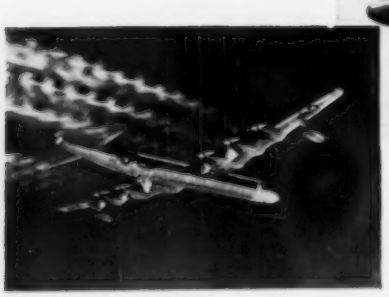
In 1940, Consolidated had purchased the assets of the inactive Hall-Aluminum Aircraft Corp. Major Fleet had long been familiar with Hall, a Buffalo firm dating back to 1927.

In November, 1941, Vultee Aircraft Corp. of Downey, Cal., a company controlled by Aviation Manufacturing Corp., later to become Avco, purchased approximately a third of Consolidated's stock (440,000 shares) and, in March, '43, Consolidated and Vultee were merged to form Convair. Before the actual merger, Major Fleet had retired as president of Consolidated, to be succeeded by Tom Girdler and, when the merger became effective, by Harry Woodhead, a Girdler associate. Thus, control of Convair was in the hands of Avco until 1947, when a controlling interest in Convair was sold to Floyd Odlum's Atlas Corp. Odlum became chairman of the board and La Motte Cohu, the old TWA executive, became president.

In the spring of 1953, General Dynamics Corp., which had been put together by the late John Jay Hopkins, purchased control of Convair from Atlas and Mr. Hopkins succeeded Mr. Odlum as chairman of the board. General Joe McNarney (USAF Ret.), who had succeeded La Motte Cohu as president of Convair in 1952, remained as president, and additionally became senior vice-president and a director of General Dynamics.

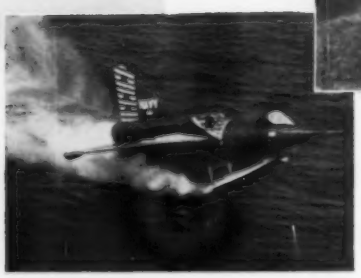
And now in justice to Convair's full corporate history, we must turn back the composition of Vultee at the time of merger

Convair 240



NB-36H nuclear test bomber

XFY-1 Pogo



XF2Y-1 Sea Dart

with Consolidated to form Convair.

Gerald "Jerry" Vultee, whom we will remember from the Lockheed story as the designer of the Sirius, after resigning from Lockheed had set up his own company at Glendale, Cal., early in 1932—the Airplane Development Corp.—but later in the year had sold the company to the Cord Corp. E. L. Cord, previously in 1929, had bought the Stinson Aircraft Corp. and merged it with his own enterprise, the Corman Aircraft Co. Previous to that, Eddie Stinson, Bill Mara, Harvey Campbell and others in Detroit had formed the Stinson Aircraft Corp. in 1926, and made themselves famous with the Stinson "Detroiter." Mr. Cord, an early backer of American Airlines, was looking for a good transport, and I judge his ventures in the industry were chiefly motivated by that fact. In any case his Stinson Aircraft Corp. shortly came out with the trimotor Stinson which flew a lot of airline miles in the hands of the various operators, Ludington Airlines, Pennsylvania Airlines, and Cord's own two lines, Century and Century Pacific, as examples.

In 1935, Aviation Manufacturing Corp. purchased Cord's Airplane Development Corp., and it became the Vultee Aircraft Division of AMC. In 1939 the division was spun off as a separate company, becoming Vultee Aircraft, Inc. In 1940, the Vultee Corp. purchased AMC's Stinson Division as well as its Detroit-based Barkley-Grow Aircraft Division; and, in 1942, also acquired the Intercontinental Aircraft Corp. of Miami, Fla. Thus, Vultee was "big business" in its own right when merged with Consolidated to form Convair.

WE WILL remember that all these later mergers were during the time that every industrial unit concerned was saturated with defense contracts and producing either complete aircraft such as the Vultee dive bomber, the BT-13, the L-5, etc., or was making parts under contract with other prime manufacturers.

From Pearl Harbor to VJ day, the Convair complex turned out approximately 33,000 military aircraft, roughly 13 per cent of the national total by weight!

But why not? Behind this effort lay an accumulation of airwise experience gathered from many sources and dating back to the very dawn of flight—Gallaudet, Dayton-Wright, Thomas-Morse, Hall-Aluminum, Stinson, Vultee, Corman, etc., etc. Woven into its evolution, too, were some of the best management talent, personal dedication, and business brains of the country—Reuben Fleet, Larry Bell, Charley Kettering, E. L. Cord (and his partner, Manning), Tom Girdler, Bill Stout, Harry Woodhead, La Motte Cohu, Victor Emanuel, Floyd Odlum, John Jay Hopkins, to name but a few.

I WISH I had the literary skill to bring some of these men alive to the reader's mind. They were such warm, uncomplicated human beings! One time in Washington, at one of the innumerable forums we were always having, I was presiding at a discussion panel. On the platform sat Orville Wright, Bill Stout, Floyd Odlum, Harold Hartney (the old Ace), Jay Hopkins, Bob Hinckley, and one or two others. In presenting Mr. Wright, I mentioned that we had at least two things in common—neither of us had any hair and our fathers were both preachers. Bill Stout held up his hand and grinned that he, too, qualified, and to the last man on the platform, it turned out that everybody was a preacher's son and had been hopelessly unsuccessful in the hirsute department. Hinckley, a Mormon Elder, had the least hair of all, and we concluded this was an extra negative dividend for selling automobiles rather than airplanes.

And now back to another of Convair's history-making ships, the B-24 or Liberator, of which approximately 18,500 were built. Convair itself produced 11,679 units of this long-legged "heavy" which was to prove so adaptable both as a bomber and a transport. The latter utility has never been highlighted, but it was a life saver in the initial stages of the war. When Japan struck Pearl Harbor, the U. S. had a total of but 27 four-engined transports—eight Boeing Clippers of Pan American, a handful of Lockheed Constellations and a dozen converted B-24s used by Army's Ferry Command. That the B-24 lent itself so readily to transport conversion was a Godsend at a critical time.

In its several versions, B-24, C-87, the C-109 tanker version and Navy PB4Y (Privateer), the aircraft was involved in 63 different contracts between government and Convair, more than its stable mates, the PBY Catalinas, PB2Y Coronados, BT-13 Valiants and L-5 Sentinels all put together. It covered every theater of war and was used by every Allied air force, it covered American geography in its manufacture and represented a major investment in defense from an economic standpoint. That it was not ordered by the Army Air Force until 1939, yet was designed and mass delivered in time to play a decisive part in the war, illustrates our point at the beginning of this article—the indispensable value of deep-rooted corporate experience. Of course, the same is illustrated by the Vultee types which came into Convair via merger—the dive bombers A-31, A-35, and the V-72 Vengeance as well as the P-66 Vanguard fighter, and the AT-19 Reliant navigational trainer. But the B-24 program is evidence above them all.

To follow this heavy bomber through the war in its various roles and special adaptations practically would require writing a history of the whole conflict. Before the United States was a combatant, "Pappy" Haines and Curt LeMay had pioneered the North and South Atlantic ferry routes and a B-24 had "snooped" throughout the Pacific island groups to case the secret Japanese preparations being conducted there, a sort of early U-2 intelligence project.

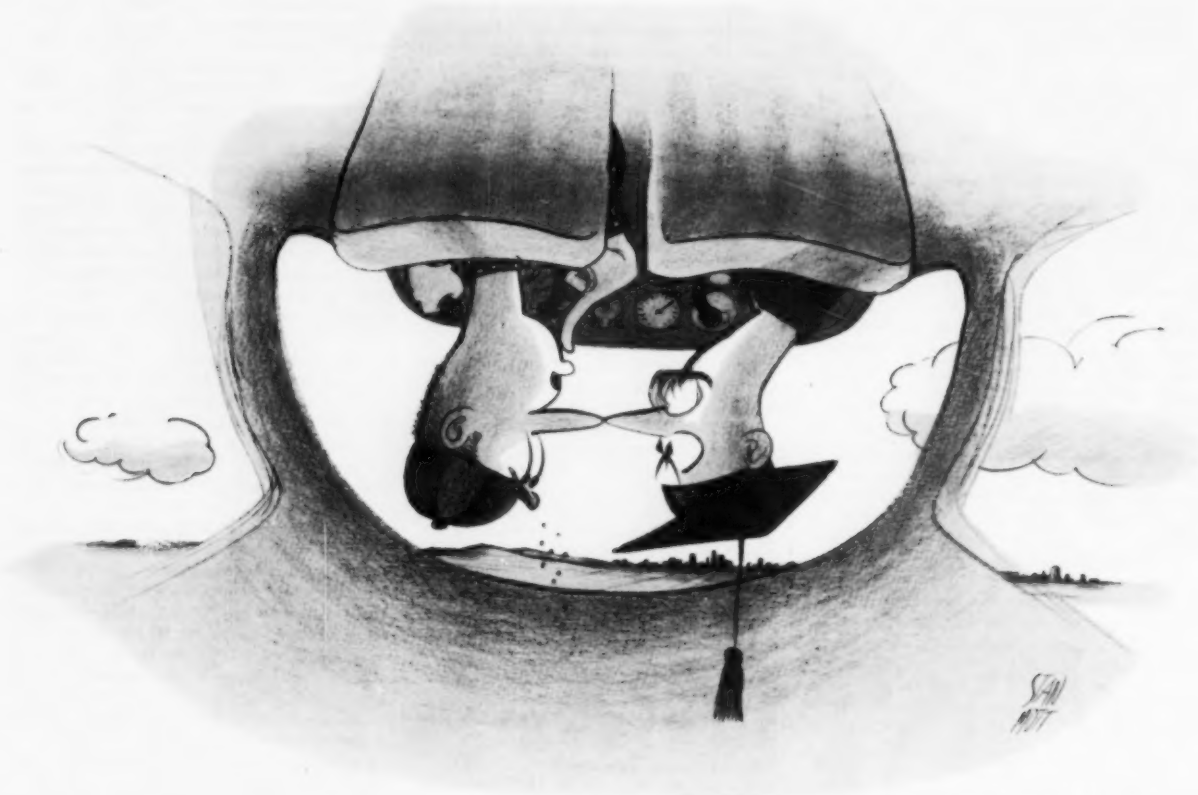
ROYAL Air Force designation for the B-24 was LB-30 and in a specially equipped LB-30 named "The Commando," Prime Minister Churchill flew to both the Casablanca and Cairo conferences. In the September prior to Pearl Harbor, Alva Harvey and Lou Reichers carried the Harriman Mission from Washington to Moscow, the Scotland-to-Russia leg of which called for 3,150 nonstop miles of cruising. Because of its range, the RAF used its first contingents of B-24s to ferry air crews between Canada and Britain.

First bombardment action involving the Convair bomber seems to have been by three LB-30s, repossessed from the RAF, and sent to Java (*Continued on page 90*)

R3Y-1 Tradewind

F-102A Delta Dagger

F-106A Delta Dart



Never take for granted that the student knows what he is about.

INSTRUMENT FLIGHT TRAINING

a good instructor is a professional teacher

Many instructors recommend the standardization of instrument training. Are they correct? This authority raises serious doubts.

By JOSEPH B. DUCKWORTH

INSTRUMENT FLYING training is the key to the safety and efficiency of all air operations, civil or military.

Recently, I attended a conference on flight safety in general aviation. School operators and flight instructors from the "grass roots" were well represented, and much, if not most, of the discussions centered about the increasing role instrument flying training plays in the safety picture.

Many of those at the conference who were directly engaged in pilot training expressed a desire to have a detailed, step-by-step syllabus or training outline which would "standardize" the teaching of instrument flying from beginning to end.

Airplanes often are more stable than pilots.

I sympathize with them, and I agree that a certain amount of standardization is a good thing. But in the *teaching* of any subject, too much standardization of detail can be a handicap, detrimental to both student and instructor.

In flight training, for example, let us suppose that the student does not want to be a professional pilot. After completing his course he intends to fly only a small, single-engine aircraft for pleasure, equipped with only the "primary group" of flight instruments. Of course he never "*intends* to fly actual instruments."

In such a situation it is far better to teach him the "1-2-3" system thoroughly (taught as an emergency procedure, suitable to, and usable with the equipment he flies) than to attempt to teach him the more precise and desirable "attitude flying" which is usable only with a full panel. In addition to the "usability" of what is taught, there is a broader consideration. It must not be forgotten that the instructor, if he would be worth his salt, is a professional teacher. His role as such in flight training is particularly vital, as upon his teaching the student's very life may depend.

A good instructor hardly can be paid enough. And it is somewhat presumptuous to attempt to tell him his business in detail.

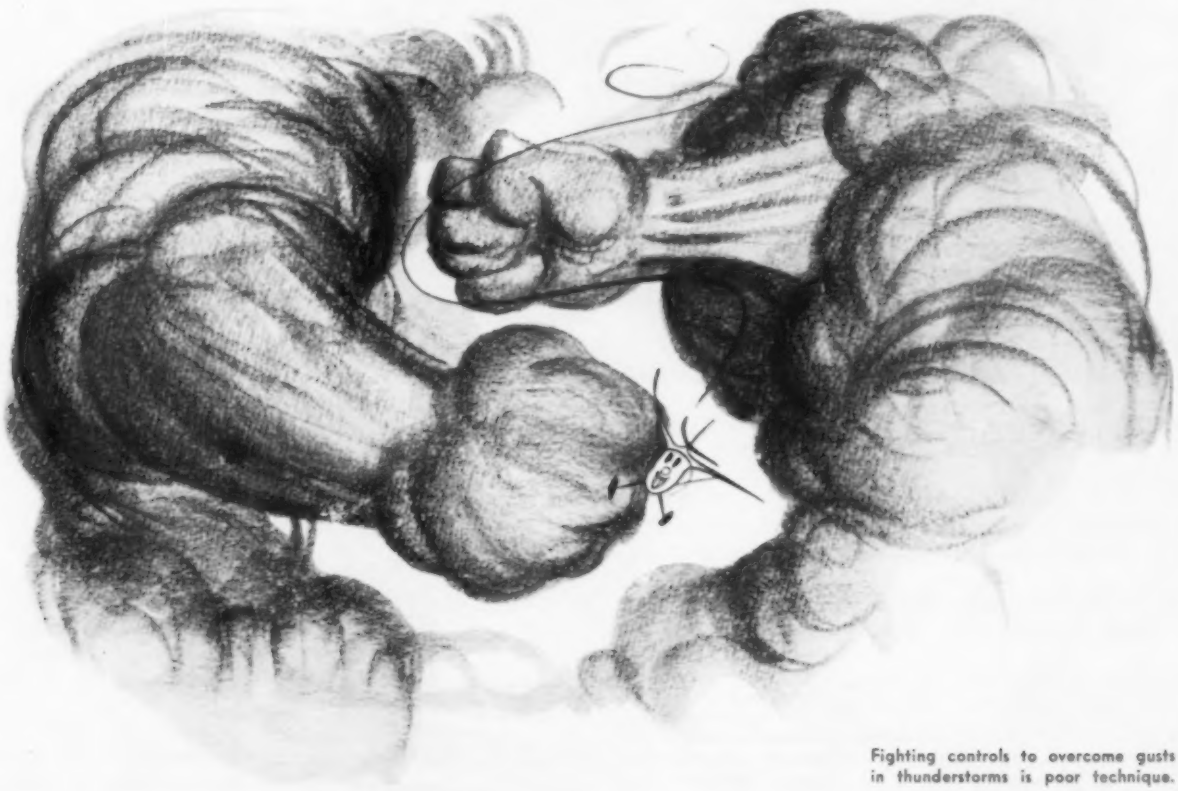
But as is often the case, there is another side of the coin. One hallmark of the good teacher is his knowledge of the broader principles and relationships which underlies his subject, and which are applicable to whatever syllabus he may choose. The syllabus used must be tailored to fit the training objective.

The flight instructor who cannot recognize, internalize and apply overall principles and relationships is probably in the wrong profession.

This article will list and discuss briefly three of the more fundamental concepts and principles which underlie all instructions in Basic Instrument Flying. This term, as used in this article, refers solely to that segment of instrument training involving *control of the aircraft*. Radio navigation, communication, traffic control and flight planning are all excluded.

1. Basic instrument flying training is a prerequisite to, and must be sharply differentiated from, other functions of instrument flying, such as radio navigation.

Identifying instrument flying with navigational functions alone is one of the most (*Continued on page* 78)



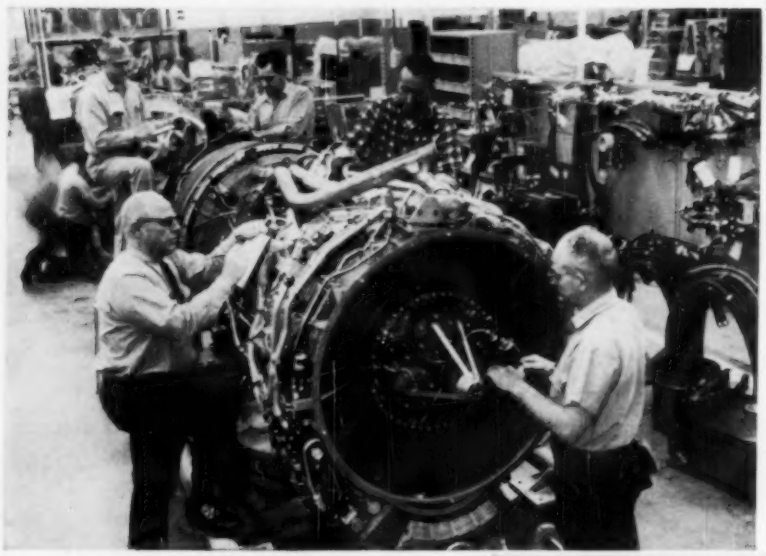
Fighting controls to overcome gusts in thunderstorms is poor technique.

GREAT EXPECTATIONS

Jets are proving to be the most efficient transports in airline history, setting new highs for schedule completion and hourly utilization. Dependability is keyed to the new and comparatively trouble-free engines.

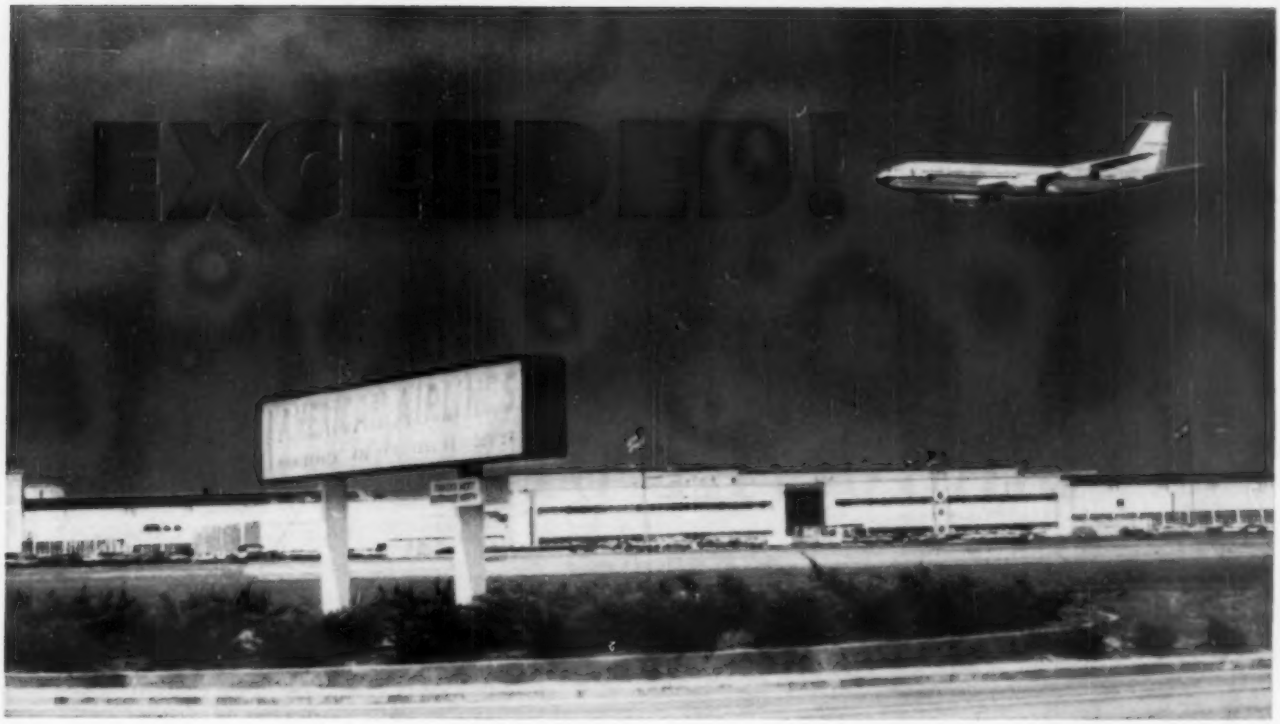
By JAMES H. WINCHESTER

Above: The American Airlines $20,000,000 jet Maintenance and Engineering Center, at Tulsa.



Left: P&W JT3 engine receiving 1,200-hour overhaul. American, for one, expects this to climb to 3,000 hours.

Right: Each jetliner returns to its company's primary maintenance base for airframe overhaul at about 2,400 hours.



THEY are the most efficient airplanes we have ever operated." So said C. R. Smith, president of American Airlines, about the jetliners that are rapidly becoming the mainstay of the airline industry. And he was echoing the general enthusiasm for the big, new planes and their dependable powerplants. They've been in operation for nearly two years now, time enough for a realistic appraisal of their worth by both the traveling public and the airlines themselves.

The public has responded by flying in ever-increasing numbers. And the consensus among industry spokesmen seems unanimous: the commercial jet age is turning out to be even better than expected.

The key to this eager acceptance is *reliability*. The new planes have established a standard of in-flight dependability that the Federal Aviation Agency has labeled "unprecedented in airline history."

As of this writing, the turbojets in service with U. S. scheduled carriers have maintained a *perfect* passenger safety record. At the same time, they've enabled the airlines using them to achieve an almost phenomenal rate of schedule completion. TWA and Continental, for instance, chalked up 99.8 per cent completion of schedules in 1959 with their Boeing 707s. And all jet carriers state that they are operating their jetliners between eight and nine hours a day, seven days a week. Continental's current schedule calls for a utilization of nearly 13 hours per day per plane.

Probably the chief factor in the jets' impressive display is the amazing dependability of the Pratt & Whitney Turbo Wasp engines that power most of the 707s and DC-8s now flying. (Of the 333 Boeing and Douglas jetliners in use or currently on order, 90 per cent utilize the Pratt & Whitney JT3 or JT4 engines.) The quietly spectacular record of the P & W powerplants was reflected in an early CAB report, which said they were performing at least seven times better than the most-proven piston engines.

O. M. Mosier, American Airlines' vice-president, Industry Planning, said some time ago: "We never have had an engine as dependable for getting the job done. We originally set them up for overhaul at the end of 800 hours. On the record of our initial operations, this figure has been moved up to 900 hours and I confidently predict that it will eventually be 3,000 hours."

Shortly after this statement was made, both American and TWA were granted extensions to 1,000-hour time-between-overhaul by the FAA. And on June 8, 1960, American was given a further extension, bringing the TBO to 1,200 hours. This marked the first time that the FAA had granted a blanket 200-hour extension on any pure-jet engine.

The P&W JT3 engine, and its more powerful companion JT4, have piled up a reliability record that is unique in the business. Pan American World Airways, first U. S. line to introduce turbojet aircraft (in October 1958) says that, during its first full year of 707 operations, it had only one engine shut-down for every 11,000 hours logged.

This is really significant when compared with the rate of one shut-down for every 1,315 hours on piston-engined DC-7s.

Trans World Airlines, flying jets since March 1959, recently revealed that it had only 20 in-flight engine shut-downs in more than 6,300 flights. During the first five months of operations with the jet powerplants, another airline experienced (*Continued on page* 62)

A GUIDE TO NAV-COM EQUIPMENT

PART II

BASIC VHF SYSTEMS

By B. V. DELTOUR

VHF, for very high frequency, has become the mainstay of aerial navigation, notwithstanding the importance of low-frequency direction-finding equipment discussed in last month's article.

VHF voice transmitters, used in towers and communication stations, are relatively simple devices with power ratings of 50 watts or less, depending on their location with respect to other transmitters operating on the same or adjacent channels. Their antenna system is a vertical rod surrounded at the base by horizontal rods or a flat sheet of metal. It is safe to say that, if line of sight exists between your airplane and the ground antenna, you will be able to hear the transmitter regardless of distance.

Line of sight, considering only flat terrain and the curvature of the earth, is 39 miles at 1,000 feet altitude, 87 miles at 5,000 feet, 122 miles at 10,000 feet, and 174 miles at 20,000 feet. In mountainous terrain, consideration must be given to intervening ridges and peaks that may intercept a line of sight and prevent VHF communication. Federal Aviation Agency (FAA) is increasing communication distances in these areas through a program of installing transmitters and receivers atop peaks and ridges, then controlling the equipment remotely from a more convenient and accessible location. In a similar manner, communications between aircraft on IFR flight plans and air traffic control centers are handled through a system of remotely operated equipment, some as far as 300 miles from the center. Communication is direct with the ATC controller handling the flight and has done much to speed up the issuance and acknowledgement of clearances and the orderly flow of IFR traffic. FAA states that these direct communications now are possible down to IFR minimum en-route altitudes along 99% of the airways.

Receivers at ground locations are marvels of workmanship and reliability. A quartz crystal, like that controlling transmitter frequencies, keeps the receiver tuned to the proper channel. To maintain "noise" from the loudspeakers at a minimum, a squelch circuit is employed to mute the receiver output between aircraft transmissions. In high-density areas, tower receivers tuned to 122.5, 122.6 and 122.7 megacycles may have the squelch adjusted to require a high-level signal to unmute the receiver output, thus eliminating many calls addressed to other towers. Generally, better results are obtained if the aircraft transmits on the same frequency as the tower. Since all calls on that frequency are intended only for that tower, the operators will keep the squelch adjusted to open on small signals. Control towers and en-route communication stations always have a tunable receiver available for use to insure the continuity of service if any of the primary receivers should fail.

The VHF Omnirange transmitters have a power of 200 watts and can provide navigational information over considerable distances. Since a reduction of power has little effect on reducing the range of service, the FAA must rely entirely on frequency spacing to reduce interference between stations. If a station is intended to provide service to 75,000 feet of altitude and 180 miles distance, it must be located better than 400 miles from another station on the same frequency.

THE energy from VOR stations is radiated from a horizontal antenna which is the reason airborne receiving antennas are also of horizontal configuration. The transmission is quite complex in that it carries two signals for navigation and must provide for identification and voice signals. The navigation information has a basic frequency of 30 cycles, well below the reproduction capacity of cabin speakers. The high-pitched note heard when tuning in an Omni station, is a 9960 cycle subcarrier which is frequency-modulated at 30 cycles. The receiver recovers the 30-cycle portion of this signal which is called the reference phase. A second 30-cycle signal, called the variable phase, is transmitted directly and lags the reference phase by an amount dependent on the position of the receiver with respect to the station, as illustrated in Fig. 1. How these signals are used in airborne equipment will be discussed in a later part of this article.

Many state and local governments are operating Omnirange stations installed at airport sites to function as approach aids in the absence of any other approach facility. These are called Terminal Omnis or TVOR. Their method of operation is identical to the en-route VOR; however, they are often located near buildings, water tanks, and other structures, and may be subject to site errors to a greater extent than en-route VOR stations. Site errors exhibit themselves as oscillations of the Left-Right needle and actual displacement of certain radials.

Airborne Omni equipment must be checked within the last 10 hours of flight or within the last ten days, whichever first occurs, before it can be used legally in IFR flight. The FAA has set limits of four degrees error for a ground check and six degrees for an airborne check, otherwise the equipment must be calibrated before use in IFR flight. To facilitate the making of ground checks, the FAA operates several stations that radiate a standard test signal that will produce a zero-degree FROM or 180-degree TO indication on the aircraft equipment, regardless of its position with respect to the station. The location and frequency of these test signals are published in the Flight Information Manual along with accepted check points for making airborne receiver checks.

All FAA VHF transmitters are amplitude modulated. The modulator, the device that puts the desired intelligence on a radio carrier, increases and decreases the amplitude of the carrier in accordance with voice or tone signal frequencies. The modulation level can be adjusted from zero to

COMMUNICATIONS EQUIPMENT

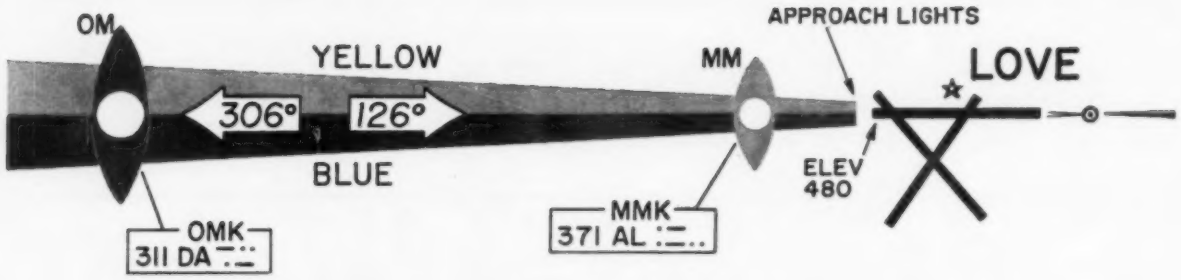
MFR. & MOD. NO.	CHANNELS TRAN.	CHANNELS REC.	TUNING RANGE	TRAN. PWR. Watts	REC. SENS. uv.	SQL. Cont.	GL. SL. SW.	TSO	NO. UNITS	POWER SUPPLY TYPE	TOTAL WT.	CURRENT @ 13.7 V Tran.	CURRENT @ 13.7 V Rec.	PANEL DIMENSIONS	DEPTH	REMARKS	PRICE UNINSTALLED
Collins Radio Co.																	
17L-8A Trans.	90		118.0-126.9	3				YES	2	Transistor	5.25	5.0		3¼x3¼	8⅝		$ 600
51-X3 Rec.		190	108.0-126.9		3.0	YES	YES	YES	2	Transistor	8.25		3.5	3¼x3¼	9¼		1180
17L-8 & 51-X3	90	190	same	3	3.0	YES	YES	YES	3	Transistor	10.5	5.0	4.0				1520
King Radio Corp.																	
KY-90 Transceiver	90	90	118.0-126.9	10	1.0	YES	NO	NO	2	Transistor	8.0	7.5	3.6	3x6⅛	8	Single Dial Tuning	795
KR-40 Nav. Rec.	—	100	108.0-117.9		1.0	NO	NO	NO	2	Transistor	4.0		3.5	3x6⅛	8		
KX-100 Com. Nav.			Combination of KY-90 and KR-40						2	Transistor	10.0	7.5	5.0	5x6⅛	8		1095
Motorola Aviation Electronics																	
LNC-100 Trans.	90		118.0-126.9	3				YES	2	Transistor	5.4	3.7		3¼x3¼	11	Rec. & Trans. Convert-	560
LNC-100 Rec.		190	108.0-126.9		3.0	YES	YES	YES	2	Transistor	6.4		3.0	3¼x3¼	11	ible to 50kc spacing &	670
LNC-100 Twin	90	190	same	3	3.0	YES	YES	YES	2	Transistor	8.6	4.2	3.5	3¼x6⅛	11	coverage to 131.9 mc.	1135
Narco																	
Mark V	90		118.0-126.9	5				NO	2	Transistor	9.5	8.5	6.5	3¼x6¼	12⅛		998
		190	108.0-126.9		1.5	YES	NO	NO									
Simplexer VC-27	27		118.1-126.7	1				NO	2	Vibrator	6.7	4.8	3.8	5⅛x6 6⅞	6¼	Whistle Stop Tuning 24 Xtals. installed	599
		Manual	108.0-127.0		1.0	NO	NO										
VTA-3A Trans.	27		118-123 or 121-127	1				NO	1	Simplexer or Omnigator	1.4	—		1⅝x6¼	6¼	Power from Omnigator or Simplexer. High Band 121-127 mc. Low Band, 118-123 mc. 2 Xtals. Installed	299
Nova Tech, Inc.																	
TR-102 Transceiver	23		118-123	2	3.0	YES	NO	NO	2	Vibrator	5.25	5.0	3.5	3⅝x5⅝	6⅝	2 Xtals. Installed	
		Manual	108-127													Headset Operation Only	229.50
Nova Star	23		118-123	2	3.0	YES	NO	NO	2	Vibrator	6.0	5.0	4.0	3⅝x5⅝	6⅝	10 Xtals. Installed	
		Manual	108-127													Speaker Operation	385
Skycrafters Aviation Radio																	
Superphone	24		118-123	2	3.0	YES	NO	NO	2	Transistor	5.0	5.5	4.0	3½x5½	7¼	2 Xtals. Installed	
		Manual	108-127													Whistle Tuning	299

COMBINATION COM-NAV EQUIPMENT

MFR. & MOD. NO.	CHANNELS TRAN.	CHANNELS REC.	TUNING RANGE	TRAN. PWR. Watts	REC. SENS. uv.	GL. SW.	TSO	NO. UNITS	TOTAL WT.	POWER SUPPLY TYPE	CURRENT @ 13.7 V Trans.	CURRENT @ 13.7 V Rec.	PANEL DIMENSIONS	DEPTH	OMNI ACCY.	CRS. WDTH.	LOC. FUNCTION	REMARKS	PRICE UNINSTALLED
Narco																			
Superhomer	12		121.5-123	1		NO	NO	1	10.7	Vibrator	5.0	4.5	5¼x6⅞	10¼	4°	10°	NO	9 Xtals.	$ 575
		Manual	108-127		2.0														
Omnigator MK II	27		118-123	3		NO	NO	2	17.9	Vibrator	6.0	5.0	5½x6⅞	10¼	2°	10°	YES	25 Xtals.	1099
		Manual	108-127		1.0														
Mark VI	—	190	108.0-126.9	—	Com. 2.0 Omni 7.0	YES	NO	1	6.5	Direct	—	3.5	3x6¼	12¼	2°	15°	YES		950

OMNI-LOCALIZER CONVERTER-INDICATORS

MFR. & MOD. NO.	VOR	LOC	GLIDE PATH NEEDLE	OMNI ACCY.	CRS. WIDTH	NO. UNITS	METER DEPTH	TOTAL WT.	CURRENT @ 13.7 V	MFRS. COMP. REC.	OPER. WITH OTHER REC.	REMARKS	PRICE UNINSTALLED
Collins Radio Co.													
344-D1	YES	YES	Optional	2°	10°	1	8	2.4	0.25	51X-3	YES	Completely Transistorized	$ 975
King Radio Corp.													
KI-200	YES	YES	NO	2°	10°	1	8	2.5	0.15	KR-40 KX-100	YES	Completely Transistorized	645
Motorola Aviation Electronics													
NavPac-100	YES	YES	Optional	2°	13°	2	5⅛	5.7	1.6	LNC-100	YES	Aural Mkr. Incl. Single Lite Mkr. Optional. Req. H. V. from Rec.	385
Narco													
VOA-3	YES	YES	Optional	2°	15°	2	2⅛	3.3	1.2	MARK V Simplexer	YES	Requires H. V. from Rec.	499



Typical ILS (instrument landing system) approach, showing localizer and marker beacons.

100 per cent without distortion. Any higher level of modulation will seriously distort the signal. To prevent the possibility of peak signals causing distortion, the FAA limits the level of modulation in its transmitters to a maximum of 90 per cent. An Omnirange transmitter is modulated 30 per cent by the reference phase sub-carrier and 30 per cent by the variable phase, leaving 30 per cent for voice and identification signals. On the other hand, a transmitter used only for communication purposes and carrying no navigational information can be modulated the full 90 per cent by voice alone. This is the reason that communication transmitters at en-route stations and towers seem to have more "punch" than the voice channel of Omnirange.

THE instrument landing system localizer signal bears little resemblance to the Omnirange signal, although both are presented to the pilot on a Left-Right meter, and the transmitters operate in the same band of frequencies. The ILS defines one course, perhaps two if the back course is usable, whereas the Omnirange defines many courses. Where the Omnirange compares signals with respect to time, the ILS localizer compares level of two signals.

If one were to draw the radiation pattern of an ILS localizer transmitter-antenna system on a map, he would find that it produces two kidney-shaped lobes. One lies to the right of the instrument runway, the other to the left, but they overlap to some degree along the runway center line. A receiver well to the right of the runway center line would hear only a 150-cycle tone. One well to the left would hear only a 90-cycle tone. Since the two patterns overlap, a receiver along the runway center line would hear both tones with equal intensity. Moving slightly to the right of this line would result in an increase of the 150-cycle tone and a decrease in the 90-cycle tone. The opposite effect would be noted if the receiver were moved slightly to the left of the runway center line. How this effect is used in airborne equipment will be related in the discussion of airborne equipment to follow.

So that an aircraft equipped with only one VHF receiver may make an ILS approach, the ILS localizer is equipped with a voice channel for the issuance of clearances. The primary purpose of the ILS localizer, of course, is to provide straight-line guidance from a fixed point some distance from, but in a direct line with, the runway center line. The center or on-course signal is sometimes used far beyond the approach lane as a means of designating a holding fix or reporting point where it intersects an airway.

The first airborne VHF equipment had a limited number of transmitting channels and a separate crystal for each. Because the circuit was not retuned for each channel, frequency coverage was limited to about one mc. Means were developed later to use a wider frequency range with a separate crystal for each channel, with some manufacturers providing automatic tuning for each channel and others relying on other means of fixed tuning to obtain a five-mc bandwidth. Transmitters of 22-27 channels, using both systems, are presently available. With the need for more and more channels, adding a crystal for each frequency in a 90-channel transmitter would be expensive and impractical. As a result, the digital types of transmitting and receiving equipment were developed and, though with their dust covers removed they look complicated, the method of frequency selection is relatively simple.

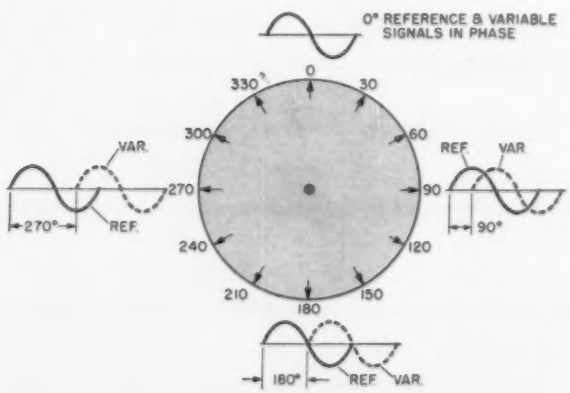


Figure 1. Many states operate Omnirange stations which send out two signals, each 30-cycle tone.

IN a 90-channel transmitter, nine crystals spaced one megacycle apart in frequency are connected to one switch and ten crystals spaced one-tenth megacycle apart are connected to a second switch. Each switch can select only one of its crystals at a time. Each bank of crystals and its switch are connected to an oscillator. The outputs from these oscillators are fed to a mixed circuit, which is an apt name for its purpose is to mix the frequencies. The output of the mixer contains the two original frequencies and their sum and difference frequencies. By means of a tuned circuit it is possible to filter out one of these frequencies, usually the sum frequency, and eliminate (*Continued on page* 82)

A MEDICAL REPORT FOR PILOTS

WATCH OUT FOR OVERBREATHING

It's frequently confused with oxygen lack. No pilot can afford to ignore its dangers.

By JOHN T. FLYNN, M.D.

THE PROBLEM of lack of oxygen for the pilot is closely related to, and often indistinguishable from, the problem of overbreathing, technically known as *hyper-ventilation.*

Both conditions produce dizziness, tingling of face, hands and feet, light-headedness, disturbances of vision, loss of muscular coordination and poor judgment. Hot and cold flashes, numbness, trembling and unsteadiness may occur.

Every pilot is aware of the danger of oxygen lack, especially when flying above 10,000 feet without oxygen equipment in an unpressurized aircraft. He should also be aware that *at any altitude,* with or without oxygen equipment, he may develop considerable physical discomfort because of overbreathing.

The problem is a common one. Of a large group of student pilots observed, almost half developed overbreathing during the stress of training flights. Experienced jet pilots have shown precisely the same symptoms. Obviously, no one who flies can afford to ignore the few simple but important facts about the two closely connected phenomena.

Oxygen lack and overbreathing appear to be very different from one another. Then how can they have exactly the same effects on the human body?

First, let's consider briefly what happens when a pilot flies for a time at an altitude well above 10,000 feet without oxygen equipment:

As the oxygen in the air thins out, less oxygen reaches the pilot's lungs, so the red hemoglobin in his blood carries less oxygen to the brain and other nerve structures. Certain nerve reflexes, jarred into action by the low blood oxygen, force the lungs to work faster and demand deeper breaths.

As a result, carbon dioxide is expelled from the lungs in large quantities. This in turn draws carbon dioxide out of the blood stream too quickly. Because of this lowered carbon dioxide in the blood, several things happen in the body: the blood becomes slightly more alkaline, contributing to muscular spasms and rigidity; the blood vessels leading to the brain contract, cutting down even more the already diminished oxygen supply. In addition, because of the low carbon dioxide, the red hemoglobin can not surrender its load of oxygen to the brain tissues.

No wonder, then, that the pilot begins to feel unsteady, to have blurred eyesight, to feel his face and lips go numb, his muscles cramp hard and his hands tighten on the controls so rigidly that he cannot move them. To make matters worse, his mental confusion increases and he is likely to make wrong decisions at critical moments. Finally, he may lose consciousness.

Under conditions of anxiety or stress, the very same discomforts and dangers can occur from overbreathing alone, even when normal or extra amounts of oxygen are breathed. Anyone can prove this to himself simply by breathing deeply and rapidly until those symptoms appear, as they most certainly will.

The explanation again is very simple. The individual is exhaling his carbon dioxide too rapidly; the carbon dioxide content in the blood is lowered, leading to greater alkalinity, which in turn causes muscular spasms; the blood vessels leading to the brain contract, cutting down the blood (*Continued on page* 92)

Converging section-line grid depicts horizon and ground and always remains parallel to ground.

3-D HORIZON

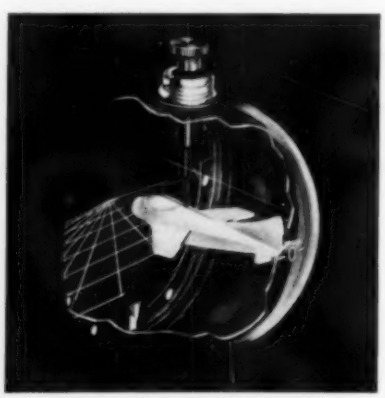
This new visual presentation of flight attitude is based upon pilot's familiarity with the picture pattern of wings, nose, sky and ground.

By TED DUROSKO

THERE IT WAS on the panel in front of me, the first major change in flight-attitude presentation to come along in our "air age." It was the new Coffing 3-D horizon, reported by the company to be the "first in a series of functional instruments destined to simplify flying and make it safer." Therefore, my approach to an evaluation of the 3-D horizon was to see if it did simplify the presentation of flight-attitude information, and whether the "messages from the instrument" were instantaneous and clear.

Both types of artificial horizons were on the panel of the Piper Comanche which belongs to Coffing Industries, Inc. That morning Jim Coffing, director of Research, had flown up from Covington, Ind., landed at Lost Nation Airport and invited me to fly the Comanche to evaluate the 3-D horizon.

In presentation, the face of the 3-D displays a small, three-dimensional airplane which is suspended from the top of the case, connected by linkage to the gyro and measures both positive and negative pitch. Behind the airplane is the converging section-line grid pattern depicting horizon and ground. This grid-type terrain reference also connected to the gyro, remains parallel to the ground at all times so that direction and degree of bank is continuously shown with reference to the miniature plane. Degree of roll or bank is indicated in 30-degree increments by a pointer at the base of the instrument connected to the representative terrain platform. Pitch is read by direct reference of the nose-tail attitude of the miniature airplane as it pivots above or below the center of the horizon. A zero-pitch indicia is located on the center of the plastic instrument face. A knob adjustment at the top of the instrument calibrates pitch for type of plane and pilot convenience. The instrument face is molded of ¾-inch ultraviolet-transmitting plastic which permits passage of cabin instrument lighting to the instrument without glare. As a further aid to night flying, the horizon-earth grid pattern and trailing edges of wings and elevators of the miniature plane are marked with luminescent pigment to glow under all standard cockpit lighting.

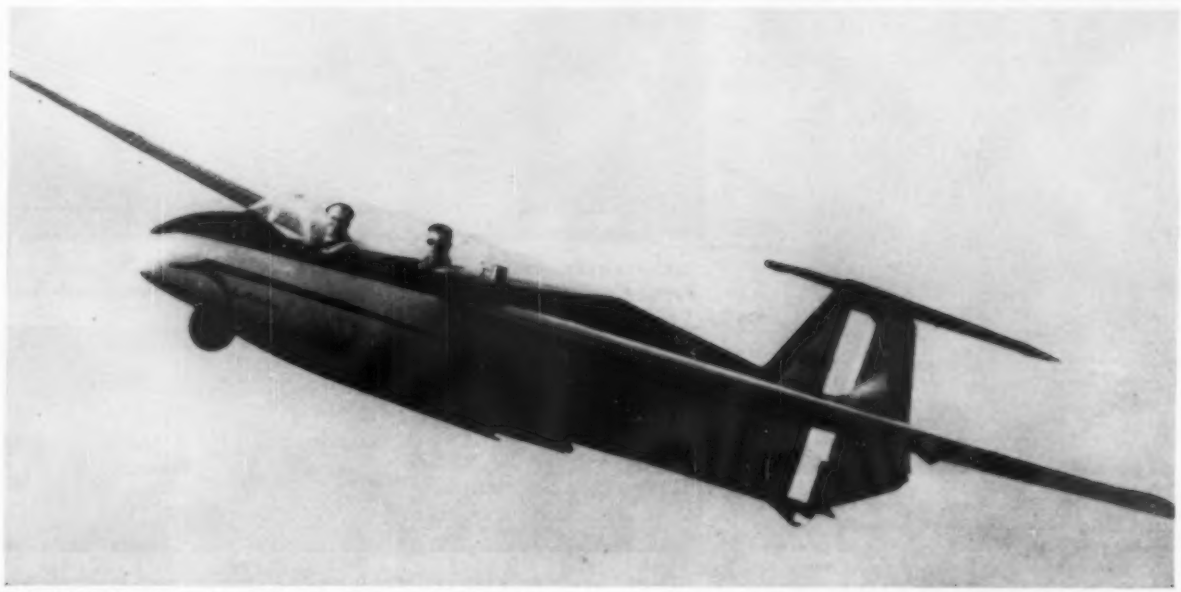


The small three-dimensional plane is suspended from the top of the case and is linked to gyro.

As I compared the two horizons prior to starting the engine, a thought flashed across my mind: would a pilot accustomed to the conventional artificial horizon need any "transition time" to gain proficiency with the 3-D? The reason for this question is that the conventional horizon is an "inside-outside" concept while the 3-D is the (*Continued on page* 58)

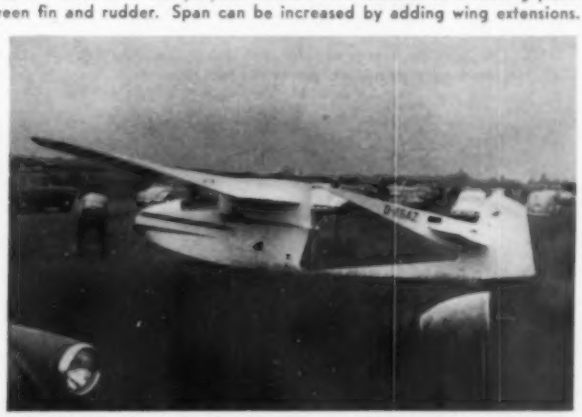
FLYING NEWSREEL

BRITISH TURBOCOPTER. *Right:* Saunders-Roe Wasp helicopter powered by a de Havilland H.1000 Gnome. Engine is rated at 1,000 shp and is based on the General Electric T58 gas turbine for which de Havilland acquired manufacturing rights. Accessories are British.



MULTOPLANE. *Above:* Manufactured in Germany by Rhein Flugzeugbau, the RW3 is a multipurpose aircraft with features of a touring plane and a sailplane. Powered by a 75-hp Porsche turning a pusher prop between fin and rudder. Span can be increased by adding wing extensions.

TURBULENT. French single-place sport plane now being manufactured in Germany by Stark Flugzeugbau is powered by a 45-hp Stamo engine. Distributed in USA by Continental Imports, Aspen, Colo.



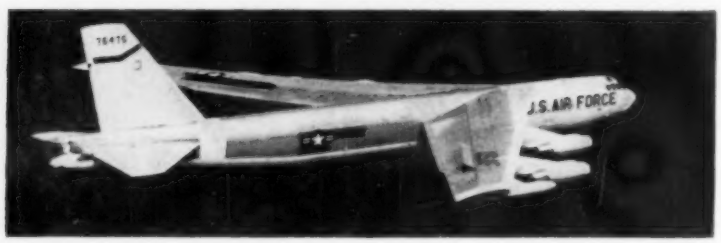
DIE KREHE. The V3 Krehe (Crow) was exhibited during the World Soaring Championships in Cologne. Powered by a 19-hp Brandel engine turning a pusher prop, it must be aero-towed for take-off.

FLYING NEWSREEL

BEECH L-23F. *Right:* U.S. Army twin-engine command transport based on the H50 Twin Bonanza. Powerplants are Lycoming IGSO-480-A1A fuel-injection, supercharged engines rated 340 hp at 3,400 rpm. Top speed 239 mph.

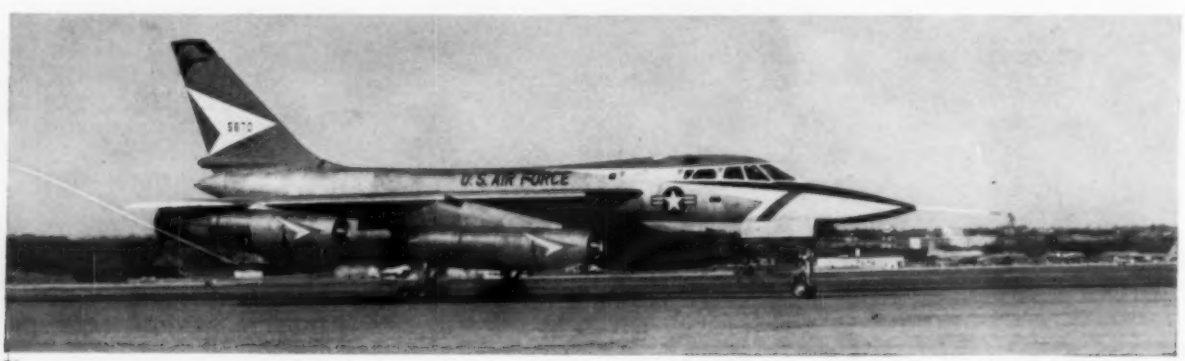
CARGO COPTER. *Above:* A study by Hiller Aircraft Corp. of a huge cargo helicopter grossing around 60,000 lbs., utilizing turbojet engines as motive power for rotors. Study of tip-jet power has been pursued by Hiller for over ten years. First example was Hiller Hornet which utilized tip ramjets.

TURBOTANKER. Lockheed GV-1, tanker version of the turboprop Hercules, is now in service with U.S. Marines. Fuel capacity is 10,560 gallons; fuel flow, 300 gals./min.



BOEING. B-52G missile bombers, when on missions, will fly to targets at altitudes less than 1,000 feet to escape radar detection. Maximum ceiling is about 60,000 feet.

T-58. To provide transition and proficiency training to pilots scheduled to fly the Mach-2 Convair Hustler bomber, four B-58s are being modified to trainers, all of them conversions from aircraft used in test program. Main difference is in increased canopy glass area.



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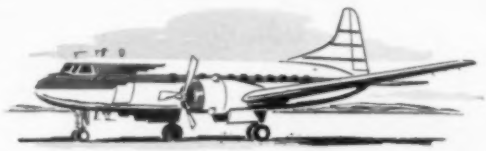

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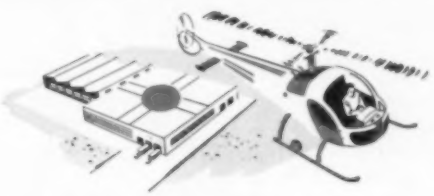

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NO. 244

I learned about flying from that!

With 40-odd hours, a pilot can be too sure of himself. But a thunderstorm in Florida can be a hard instructor!

By C. F. HART Jr.

MY MOST IMPORTANT lesson in solo cross-country flying came early in September, 1957. I was attending a VA-approved flying school at Tampa International Airport, Fla. Since completing my dual cross-country requirements two weeks previously, I had been concentrating mainly on solo cross-country flights to build up my flying time. I was in a hurry to get my commercial rating.

With a total of 40-odd hours flying time, including about five solo cross-country flights, I was getting pretty cocky about my navigating ability. On this particular morning I arrived at the airport at 0600 hours and checked weather for a trip forecast from Tampa to Leesburg via Orlando-Daytona Beach. Tampa forecaster advised that heavy ground fog and a 2,500-foot haze layer would keep the Tampa area IFR until about 1000 hours, Orlando being the same, but with the fog dissipating after this time. However, scattered thunderstorms were expected in this vicinity after 1300 hours. Since central Florida has more thunderstorm days per year than any other section of this country and, as I had a few solo cross-country flights behind me, I had encountered quite a few thunderheads but had always been able to bypass them. I decided to take off as soon as it became VFR both at Tampa and Orlando.

At 1130 hours it looked better, so I filed my flight plan, pre-flighted the Cessna 120, and returned to the school operations office to phone the control tower for taxi clearance (the VHF receiver and transmitter were inoperative). Since I was starting later than anticipated, and since the radio was not working, the school wanted me to stop at Orlando to have the radio repaired, so I just filed the flight plan from Tampa to Leesburg via Orlando. After receiving clearance from Tampa tower, I proceeded with my run-up, got the green light, and took off.

After leaving the pattern I took up my plotted compass heading, throttled back and adjusted the trim tab to cruise at 1,500 feet. It was rough since the ceiling was 2,000-feet broken with numerous cumulus build-ups all around. Maintaining compass heading, I started a visual orientation to line up with my Orlando sectional chart and find my exact position. I could not find any of the prominent landmarks that should have been encountered! Visibility was about five to seven miles and, while still trying to orient myself, I saw an airport ahead, about five miles off. I landed and taxied over to the lone building, parked my plane and went inside. Swallowing my pride, I inquired at the Eastern Air Lines counter just where I was. To my amazement they said I had landed at Lakeland. Making more calculations, I found that my compass was over 40 degrees off. Contacting Tampa radio by direct line from Lakeland, I advised them of my error and refiled for Leesburg via Orlando.

I took off again and focused my attention on the Orlando Sectional Chart and the terrain beneath. Over Haines City the plane was hit by a tremendous gust of wind from my left which felt exactly as though I had been hit by another plane at a 90-degree angle. Ahead lay the blackest, most ominous-looking thunderhead I had ever seen in Florida. Being a Texan, I would not have been surprised had there been a tornado funnel beneath it. Regaining my wits, I made the 180-degree turn and headed for Lake Wales airport, about 15 miles south. I landed there and had the aircraft tied down. No sooner had the plane been tied down than the grandpappy of all CBs hit the field and, for 30 minutes, the rain came down by the bucketfulls. The wind reached 45 knots in gusts. Within 30 minutes, the thunderhead passed and the sky behind it was clear with unlimited visibility. Notifying Orlando radio by telephone, I refiled my DVFR flight plan and gave my expected time of ADIZ penetration and my ETA at Orlando. The flight to Orlando was without incident from where I continued to Leesburg.

Returning to Tampa the following morning, I was much the wiser. My ego had been deflated by this experience, but I felt that in the long run it would make me a better pilot.

In rehashing this trip with one of the instructors, he pointed out that, in cross-country flying, a pilot must know exactly where he is every minute so that, in the event of an emergency, he can make decisions with minimum delay, whether giving his position to the nearest FAA facility guarding the emergency frequency or in picking an alternate destination. END

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ZAHNS AIRPORT

Soaring Olympics

(Continued from page 34)

equipped with speed-limiting dive brakes. Presumably, such sailplanes are production types, readily available at a reasonable price. Most of them were, but on some there was hedging as to delivery time, cost and production schedules, when their pilots and designers were approached by interested parties. The Polish Standard Foka was a highly sophisticated design, with the pilot seated in a reclining position to cut down the frontal area of the fuselage, and appeared to be a derivative of the Open Class Zefir super-sailplane.

In the Open Class everything goes, one can say, short of a derocketed X-15. It is here that designers give full vent to their ingenuity. Not being restricted to span, some sailplanes, like the Yugoslav Meteor, exceeded 60 feet, featured retractable single-wheel landing gears, tail drag-chutes instead of spoilers for glide-path control, flaps, radio, and what appeared to be "thermal sniffers." These extremely sensitive probes to detect the slightest temperature variations were spotted on the wing tips of one of the Polish Zefirs. Most sailplanes were equipped with full blind-flying instrument panels, including artificial horizons especially developed for sailplanes. Cloud flying was not permitted, with the exception of the last three competition days when specific areas were designated for this purpose.

The winners: *Left*, Rudolfo Hossinger, Argentina. Open: Heinz Huth, W. Germany, Standard.

U. S. entry consisted of two sailplanes in the Open Class, the RHJ-6 Adastra flown by Richard Johnson, U. S. National Champion, of Arlington, Tex., and the Airmate HP-8, flown by Richard Schreder of Toledo, O. Johnson's ship, of all-wood construction, with a span of 58 feet and T-tail, was finished by him shortly before the championships, and he did not have sufficient flying time on it to get thoroughly familiar with its performance. Because of its size and mahogany plywood covering, the Adastra was dubbed "Mahogany Bomber" at Butzweiler. Schreder's sailplane was of all-metal construction, with polyester filler on its exterior surface for smooth overall finish. As with Johnson's Adastra, Schreder's HP-8 was designed and built by its pilot, although the ship was two years old. It had a span of 51 feet 9 inches. U. S. entry in the Standard Class was the all-metal Schweizer 1-23H-15, flown by Paul Bikle of Lancaster, Cal.

For purpose of communication with pilots in radio-equipped Open Class sailplanes and trailer crews who went out to pick up the ships after landing, each country was assigned a frequency that it requested. The U. S. team operated on a Unicom frequency of 122.8 mc.

The opening day of the World Soaring Championships was all fanfare and ceremony with speeches from a flag-surrounded tribune by officials of the West German government, VIPs of the FAI and the German Aero Club, to the accompaniment of a medievally clad band. The "piece de resistance" was a fantastic exhibition of precision aerobatics by German stunt aces Albert Felderbaum and Herbert Tilling, in two Lo.100 aerobatic sailplanes. Their fare consisted of a series of rolls in tow, inside and outside loops in free flight, supplemented by Cuban Eights, and snap rolls with colored smoke, ending with an inverted buzz-job a few inches off the ground at close to 200 mph with a fast, arcing zoom to normal flight attitude for a landing.

Only seven of the 14 days saw competitive flying. Of these, six were counted as official for earning points; the remainder were either unsuitable weather-wise, or rest days following long cross-country tasks. Two were "neutralized" because no two pilots in each class accomplished the minimum distance of 50 kms (32 miles) required in order that the day may be considered a "contest day." A rule-interpretation hassle developed during one of these days as one of the Open Class pilots, the Dane, Harald Jensen, though having flown well in excess of the required 50 kms, landed so far off the fixed course line that the resulting penalty brought down his recognized distance to below this figure. In the meanwhile, the British pilot Nicholas Goodhart, legally exceeded the 50 kms which put him on the top of the list in the Open Class. The Poles and the Germans filed a protest when the contest committee decided to call it a contest day by crediting Jensen with a contest flight. After considerable arguments and meetings between the FAI, contest officials and team captains, it was voted finally to neutralize the task.

Tasks to be flown by pilots were announced every morning at a briefing in the large Belgian Air Force hangar where the weather conditions for the day also were explained. Tasks consisted of triangle courses of 100, 200 and 300 kms in length with return to Butzweiler; distance over a fixed course with a landing not to exceed four kms (2.5 miles) to the right or to the left of the course line. Any distance beyond that was deducted from the actual distance flown. Other tasks were out-and-return flights and open distance where no target was indicated, final destination being up to the pilot. In many of the events speed was an important factor and counted heavily toward points earned by the pilot. For the best accomplishment of the day 1,000 points were awarded. Task selection, in general, was the weak point of the meet. Contest officials displayed little imagination in setting them up. On two particular occasions, when conditions were so good that even a piano would soar, the pilots were sent out on a straight, open task flight downwind—more suitable for a beginner soaring pilot—instead of a tough 300-kms, or more, triangle course event with speed points, which would have been real competition for experts. On the other side of the ledger, flight operations left little to be desired. The feeding of 55 sailplanes into the take-off line was an example of German thoroughness and orderliness. Launching time was extremely fast, the 25 Do.27s towing off, on an average, one sailplane every 30 seconds.

Menahem Bar of Israel in his Zugvogel II, attended by crew. Placed 13th in Open Class.

The Yugoslavian Meteor 60, like the U.S.A. ships, only all-metal sailplane. Span, 65 feet.

The Swiss Elfe M flown by René Comte in Open Class had laminar flow wing, placed 11th.

One of the French Breguet 905 Fauvettes, Standard Class. Flown by Daniel Barbera.

As previously mentioned, the Poles almost ran away with the contest. The three of them, Edward Makula and Jerzy Popiel flying the Open Class Zefirs, and Adam Witek, in the Standard Class Foka (Seal), led the meet for the majority of days. The three always flew together, practically in formation. As someone remarked: "If one

(Continued on page 56)

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Norman Blake, President, heads up Aircraftsmen in Oklahoma City while Haskell Shaw (right) is manager of Amarillo Division.

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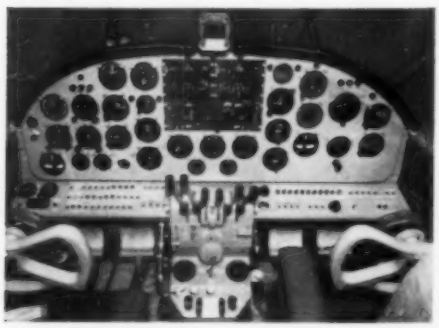

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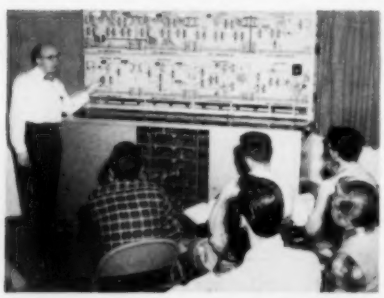

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(Continued from page 54)

goes down, the rest will have to follow." Inasmuch as one of the Zefirs was equipped with "thermal sniffers," its pilot may have acted as pathfinder for the others. However, the skill of these pilots and the quality of their ships and instrumentation was undeniable, whatever methods they may have used.

Brilliant flying was not done by the Poles alone. The British pilot, Nicholas Goodhart, in an Open Class Olympia 419, twice rose to first place during the meet, once unfortunately to no avail, as on that day the task was "neutralized." In the long run, it was good consistent flying, not brilliancy and tactics, which won out. The final laurels in the Open Class went to Rudolfo Hossinger, an Argentinian of Swedish descent who, by profession, is a company pilot for Gulf Argentina, flying an Aero Commander. Hossinger piloted a British-built Skylark III. He never achieved first place during the meet until the last day, June 16th, the 17th being plagued by poor weather, but was consistently among the first six.

In the Standard Class, Heinz Huth of Germany took first place flying a Schleicher Ka.6 Br, the most successful Standard Class ship in the contest. Ka.6s took first, second, fourth, fifth and sixth places, with Witek's Foka taking third. Next best in this class was the Standard Austria, a beautiful V-tailed sailplane of Austrian origin, which was adjudged best-of-design in Standard Class during the OSTIV (Scientific and Technical Organization for Soaring) convention, held at Cologne during the championships. The Schleicher Ka.6 won this distinction two years ago during the World Soaring Championships at Leszno, Poland.

The final standings for the U. S. team in the Open Class had Richard Johnson, 15th; Richard Schreder, 16th. In the Standard Class, Paul Bikle was 12th.

Dick Schreder was one pilot who supplied a touch of drama. On June 8th, during an Open Day distance task in the northeast direction toward the Danish border, when 17 sailplanes flew 306 miles, he drifted off his course and, instead of crossing the bay of Kiel, crossed the bay of Luebeck to the east. Running out of altitude, Schreder came down in an open field, only to be met by two military individuals toting submachine guns. Then it dawned on Dick that he inadvertently had crossed the border into East Germany. On the assumption that he had ditched, a sea search was instituted for him in the meantime by the German Navy. Only after six hours of waiting, the meet officials and U. S. team captain Paul Schweizer were notified of Schreder's plight. Meanwhile, his crew and Mrs. Schreder were in Luebeck trying to get through to him with the trailer. After some judicious telephoning, permission finally was granted by the East German authorities for the crew to cross the border and retrieve Dick with his HP-8. He spent an anxious 20 hours among the communists but was courteously treated and even given a shave and breakfast.

In final analysis, the Standard Class sailplanes did exceedingly well at this year's World Soaring Championships; as a matter of fact, better than the Open Class ships. Prime reason, of course, was the weather situation, which was predominantly on the weak side, favoring the craft with lighter wing loadings. Final results in the Open Class prove this. The champion flew a far more conventional sailplane than the Zefirs, Meteor, Adastra and the like, more capable of exploiting weak thermals. The Standards, however, finished the greatest percentage of assigned tasks.

The 55 sailplanes and pilots covered a total of over 70,000 kms. (44,000 miles) during the seven flying days and established a number of national records. The next World Soaring Championships are tentatively scheduled for 1962, but whether they will be held in Argentina, native country of the Open Class winner is debatable. Argentina may not want the Championships because of high costs in conducting such an event. In addition, a trip to South America might prove too expensive for some of the countries involved. END

Win Flying Award

Flying a Piper Tri-Pacer in this year's All Woman Transcontinental Air Races, Betty Faux, pilot, *left*, and Carole Dunn, co-pilot, *right*, both of Santa Monica, Cal., won the annual FLYING Magazine award of $100 for the best score made by a crew with less than a combined total of 500 hours solo time. They placed eighth in the event. Mrs. Aileen Saunders, of El Cajon, Cal., 1959 winner, placed first again this year.

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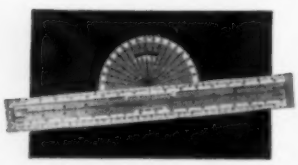

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3-D Horizon

(Continued from page 48)

opposite, or "outside-inside" concept.

For instance, with the conventional horizon, when the "little airplane" is below the horizon bar, it indicates that the nose of the aircraft is below the natural horizon as in a dive or glide; when it is above the horizon bar, the nose of the aircraft is up as in a climb or at a high angle of attack. With the 3-D horizon, when the nose of the aircraft is below the natural horizon, its tail is above the zero-pitch indicia on the plastic face; when the tail of the little airplane is below the zero indicia, the nose is above the natural horizon. This creates a little confusion until you realize that the overall "outside" view of the little airplane from tail to nose has been brought "inside" the cockpit. It is as though a television camera located somewhere behind the aircraft is photographing the aircraft in relation to the natural horizon and then televising it to a small, 3-D screen located on the instrument panel. Once you accept this concept, the mild confusion disappears and flying the 3-D horizon becomes a natural reflex action. I found this to be so, shortly after take-off. Lost Nation Airport is located a few miles from the southern shore of Lake Erie. As the wind was from the north, I headed the Comanche down the active runway and on becoming airborne, tucked in the gear, backed off the throttle and prop setting to climb power, setting up a shallow climbing turn to the left. Within a minute or so we were out over the lake and into a heavy haze which blended into the water.

Instinctively, I looked at the artificial horizon which in this case was the 3-D (it was located on the panel in front of the pilot, while the conventional one was off to the right), and found the little airplane "banked" gently to the left and with its tail slightly below the pitch-level reference point—as pictured against the grid-line terrain platform, the airplane was in a shallow climbing turn to the left. To verify the attitude and to check the flight path, I made a cross-check with the other instruments: airspeed at 100 mph for climb; turn indicator showed half-a-needle-width turn to the left, while the ball was centered; rate-of-climb read 600 fpm up; altimeter was winding toward 1,500 feet; the gyro compass was turning slowly toward 270 degrees; tachometer and manifold gauge reflected the climb power setting. The 3-D was "giving the right message."

As the Coffing 3-D horizon meets the legal requirements for both VFR and IFR flight in aircraft with gross weights below 12,000 pounds, I slanted the air checks from both views. Heading the Comanche to the southwest where the haze was less and the sky broken, I started to check the action of the 3-D instrument against the natural horizon. In a series of climbs, dives, moderate and steep turns, and a combination of climbing turns and gliding turns, I found that the Coffing horizon gives instantaneous and true sensing, three-dimensional attitude readings. It was not affected by rough air which we encountered over hilly terrain.

At this point I slipped on the Francis

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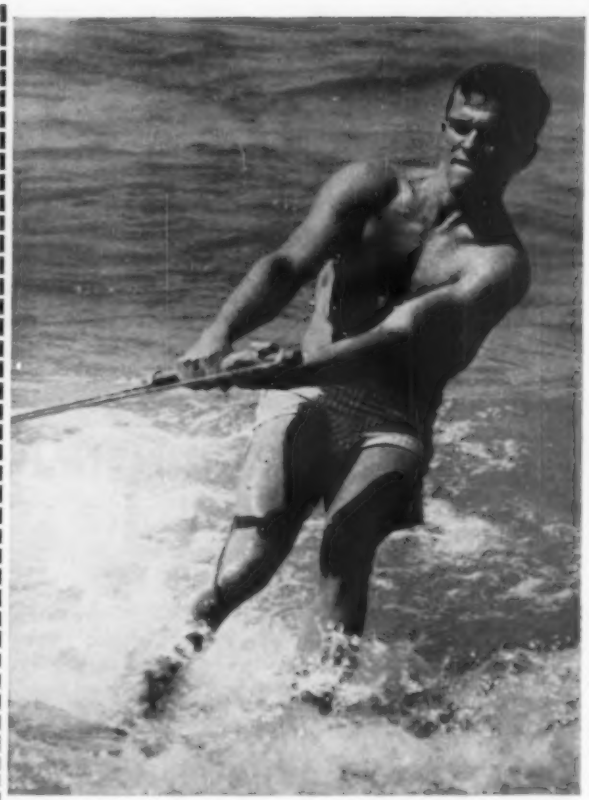

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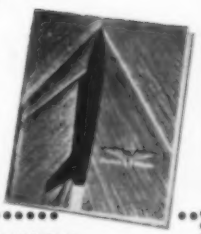

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(Continued from page 58)

hood to get the feel of the 3-D under simulated IFR. Jim Coffing and neighbor Ed Keehn who were aboard, took over the "lookout" responsibilities as I repeated the series of turns and climbs. Here is where I believe most pilots will find a decided advantage when using a 3-D gyro horizon. As the instrument designed by Jim Coffing is true sensing, and that it reports in the familiar terms of a three-dimensional realism of sky, ground and airplane, the pilot can use his "observation" skill developed by VFR flying to control the attitude of his aircraft.

As a result, I felt at home with the instrument as soon as the hood came down over my eyes. Flying on the gauges became pretty much a matter of flying the little airplane through shallow banks, steep banks, climbing and descending turns, and on straight-and-level courses. Too, I like the fact that the amount of negative or positive pitch can be read directly off the instrument, to aid in establishing climbs or descents.

In the case of a non-weatherwise VFR flyer trying his hand at instruments, I found that the 3-D can make a very nice introduction. Ed Keehn, that neighbor of mine, has a total of some two hours of "stick time" in my airplane and this was his first time in a Comanche. Jim Coffing swapped seats with him and Ed climbed into the front right seat. I invited Ed to take the controls and check the action of the 3-D against the natural horizon.

For several minutes Ed made turns, climbs and mild dives as the Comanche rocked through some rough air. Then I noticed that he was flying straight and level and making turns by referring only to the 3-D horizon. This gave me an idea and I passed the Francis hood over to him. Keehn put on the hood for the first time in his life and maintained good control over the Comanche by flying the little airplane in the 3-D horizon. He flew straight and level in moderately rough air, and later made 180-degree turns without losing more than 120 feet of altitude. He reported no unusual sensations when flying the 3-D horizon under the hood, and said that he enjoyed the experience.

In weight, the Coffing 3-D gyro horizon is within several ounces of the weight of the conventional artificial horizon. It fits the same size panel cutout and is operated by the same amount of vacuum (four inches). An A & P can install it in about 30 minutes in most light airplanes, when the 3-D horizon is to replace the conventional one. In aircraft such as the Bonanza, where there is a double instrument panel, the installation time is longer.

Coffing's 3-D horizon is a conventional gyro horizon which has been remanufactured and modified. Price is $337.50 for outright purchase; Jim Coffing said an allowance is made for a serviceable conventional artificial horizon, if exchanged. All 3-D horizons are guaranteed for 90 days, regardless of hours used during that time.

If the 3-D horizon is the first of a series of functional flight instruments to appear, and if the others are as true-sensing, precise and as easy to interpret, it can be the advent of major advancements in the field of instrumentation for private craft. END

ESSO

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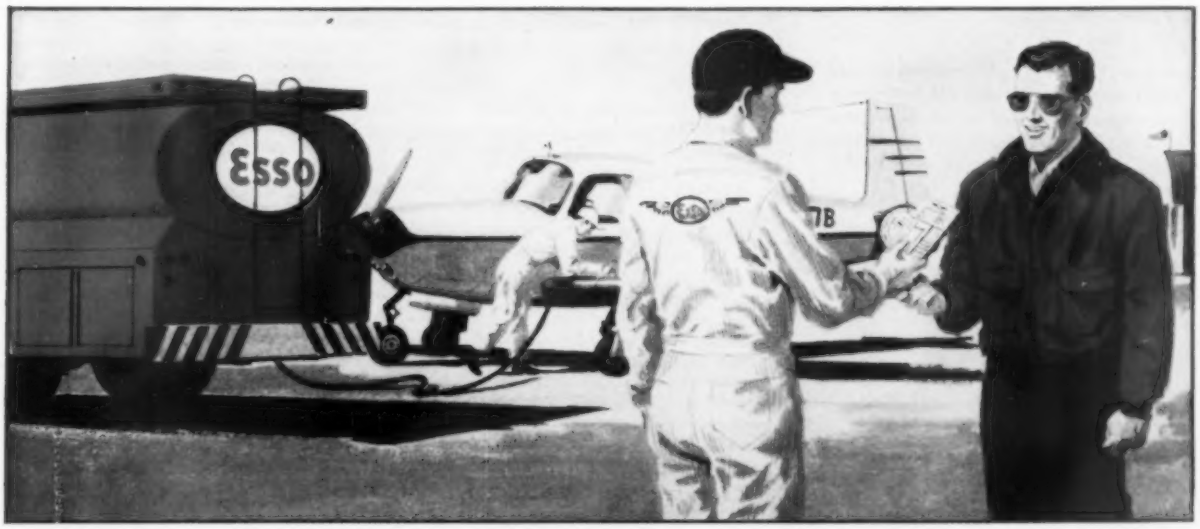
TAKE 5 — Although checking lights before night flights is SOP, many pilots fail to take the 5 seconds necessary to check their tail light. Running into old friends is fine, but not while flying. So take 5 — and stay alive.



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Great Expectations

(Continued from page 43)

only two shut-downs in 48,380 hours of flying, neither of which required an engine removal.

United Air Lines began its commercial jet service with the DC-8 in September 1959, using the Pratt & Whitney JT-3 engines. J. A. Herlihy, UAL senior vice-president for Engineering and Maintenance, has declared that the powerplant (which first went into production in 1953 for the military as the J-57) has exceeded all expectations. Engine performance, he said, "has been truly phenomenal . . . reliability has been ten times as good as the best we have ever experienced with piston engines."

Unscheduled engine removals can send maintenance costs soaring. In the first 12 months of Boeing 707 operations, which saw a limited number of the planes in use, U. S. carriers flew the jets approximately 40,000,000 miles using some 400 P&W engines. This came to a total of 303,744 engine-hours of operation. *But it involved only 23 engines prematurely removed for overhaul*, which figures out to 13,200 operating hours per premature removal. The R-2800 engines which power the DC-6, by way of comparison, have a record of 7,143 hours per premature removal.

An FAA spokesman summed it up by saying, "Industry-wide, the jet engine reliability record is about 20 times better than for most piston engines."

This remarkable dependability has been clearly reflected in increased passenger bookings, with some 55.6 million passengers carried by U. S. scheduled air carriers in 1959, compared with 49.1 million the previous year, when jet operations were just beginning. Qantas, the first foreign operator to use the 707, reports that advance bookings are now three times heavier than they were at the same time a year ago. American Airlines registered a 14.3 per cent increase in passenger-miles in 1959 over 1958. And although January is usually considered an "off-peak" season, Continental Airlines states that last January was the biggest month in its history, thanks to public acceptance of its jet service.

The load factor picture has been equally bright. During early 1959, when jet service was still new, the jetliners were generally running 90 per cent full. TWA's 707s operated with a 96 per cent load factor in 1959, while American Airlines recorded 95 per cent and Pan Am 91 per cent. As competition increased on the various routes, however, the nationwide average fell to between 60 and 75 per cent early this year. But that is still well above the jets' break-even point of about 50 per cent.

There are, of course, good reasons for the dependability of the jet engines. For one thing, the turbojet is by nature a less complex powerplant than the reciprocating engine, containing fewer moving parts and consequently subject to fewer component failures. Also, a high degree of ruggedness has been built into the JT-3 and JT-4 by the manufacturer. And Pratt & Whitney's years of experience making the military J-57 engine has provided them with a backlog of know-how to apply to its civil-aviation counterparts.

There have been passenger and crew complaints about the air conditioning system in the 707, and occasional trouble with water pumps. Some of these bugs have been ironed out and others have simply not reappeared in the course of subsequent inspections.

All in all, the airlines report that the jets have been broken in with far less difficulty than is ordinarily anticipated with new equipment. "They are unbelievably above expectations," says AA's Mr. Mosier. And his boss, American Airlines President C. R. Smith, has said: "The break-in record of our Boeing 707s—particularly from the standpoint of reliability and safety—is the best of any airplane type introduced by American in its history."

To insure that the jetliners continue operating steadily and safely, the airlines have set up vast maintenance and overhaul programs.

All of the commercial jets now are handled under a system known as "Progressive Overhaul." In this system, every part of the aircraft (except its engines) is programmed for a field-check after a specified number of hours, regardless of whether it has malfunctioned or been written up. A complete cycle of this kind lasts 8,000 hours.

In addition, each jetliner returns to its company's primary maintenance base and undergoes a complete airframe overhaul after a certain number of hours, generally about 2,400.

The engines are handled apart from the Progressive Overhaul cycle. They are completely torn down, X-rayed and overhauled every 1,200 hours. Keeping up with the requirements of the commercial jet era has prompted most of the larger airlines to establish huge, new maintenance facilities, such as those operated by Pan Am, United, Northwest and TWA.

One of the largest airline maintenance bases for jetliners is American's Jet Maintenance and Engineering Center, Tulsa, Okla. The $20,000,000 center was greatly expanded and re-equipped to gear it for its special task of caring for the new planes. Additional equipment, more hangar and service space, a jet-fuel tank farm, an engine and accessory overhaul area and two massive jet-engine test cells were added to the existing facilities.

The first 707 to be completely overhauled by a commercial airline went into the Tulsa center last November 7, and emerged two weeks and 13,000-plus man-hours later to go back into service.

American is concentrating overhaul of its Pratt & Whitney jet engines at this center. "The overhaul problems for the jet engines are far simpler than those for piston engines," comments F. C. Wiser, American's vice-president in charge of Technical Services. "The jet engine eliminates three great sources of trouble found in piston engines: ignition systems, carburetion systems, and the complex mechanical construction of the engine as a whole. Also, there is less fluctuation of internal operating temperatures in the jet than in the piston engine."

The new aspects of jet maintenance and overhaul have presented the airlines with grave problems in re-educating maintenance personnel. American handled the

(Continued on page 64)

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(Continued from page 62)

problem by having instructors travel to every one of its bases in the U. S., Mexico and Canada. In addition, AA mechanics have been sent back to school at Tulsa, as well as at the Boeing and Pratt & Whitney plants. To handle the huge, system-wide job of re-education, American Airlines instructors have taught and are teaching a total of about 170 courses in jet maintenance, overhaul and engineering.

Such education is expensive. AA has already invested more than three-quarters of a million dollars for training aids and equipment alone, including: complete powerplants (worth about $150,000 each); animated mockups of structures and components, and complex working models of aircraft systems.

By mid-1962, when American expects to have all its jets, the transition and training program for ground and flight personnel will have cost more than $9,000,000, roughly the price of two Boeing 707s!

If the immediate past is any indication, however, these extensive preparations will more than pay off for the airlines as well as the flying public, in terms of aircraft reliability, schedules made good, and overall safety of operations. END

Dyna-Soar—Hypersonic Glider

(Continued from page 29)

contractor, with the major responsibility for integration of all Dyna-Soar's subsystems, construction of the glider, mating of glider and rocket booster, assembly and test. The Martin Company will manufacture the booster. The Air Force's Wright Air Development Center is charged with technical direction of the whole program, and Ballistic Missile Division of Air Research and Development Command will have booster supervision.

Ready for launch, the Dyna-Soar system will consist of three stages. The top stage is the glider, a relatively small, one-man vehicle weighing less than 10,000 pounds. It will be of delta-wing configuration and have aerodynamic controls for flight within the atmosphere. The first research glider will not have reaction controls for space flight, but in Phases II and III such controls will be added for space maneuverability.

The two lower stages are the boosters, adopted from Martin's Titan intercontinental ballistic missile. The lower stage, 54 feet long and capable of turning out 300,000 pounds thrust, is basically the same as that of the current missile, except that large cruciform fins will be added for stability in the early take-off stage. These fins are being added because of the aerodynamic configuration of the payload (the glider) which will produce greater bending loads.

The upper stage will be an elongated version of Titan's current second stage. More than 40 feet long, it will have an additional thrust of more than 100,000 pounds. The whole three-stage unit will be about 115 feet tall.

USAF officials stress that the first Dyna-Soar is simply a research tool, but they are very interested in its potential uses as a weapon system.

(1) As a manned hypersonic bomber, flying suborbitally several times around the earth at a speed of 15,000 miles an hour or in orbit at approximately 18,000 miles an hour. It would carry several bombs which would be, in effect, miniature Dyna-Soars.

(2) As a manned interceptor for defense against ballistic missiles or as an inspector of unidentified space objects. It could, for instance, maneuver close to an enemy reconnaissance satellite and either destroy it or render its equipment useless.

(3) As an unmanned orbiting bomb, which could be ground controlled. Orbit could be changed frequently, an advantage over the predictable path of an ICBM. It could be directed to a point on earth at any time.

(4) As a suborbital or orbital reconnaissance vehicle, a manned version of the "spy-in-the-sky" satellite.

(5) For the days when space operations come about, as a space ferry to large space stations, a rescue vehicle, or a "space truck" for maintenance of other space vehicles.

Fantastic as it sounds, Dyna-Soar is not one of those dream projects for the indefinite future. If the current schedule is maintained, it will carry a man into space within four years. Boeing is now well along on the engineering work and expects to have a mock-up ready by next summer. A flyable article should be rolled out early in 1963, glide-tested that summer.

The first glide tests will be conducted along the pattern used for previous rocket airplane experiments, such as the X-2 and X-15. The Dyna-Soar glider will be carried aloft by a modified Boeing B-52 jet bomber and dropped at altitude. For these tests, Dyna-Soar will have a rocket engine to test the aerodynamic configuration.

Upon completion of the glide tests, the glider will be launched unmanned in a series of suborbital stability and control tests. These will be conducted at Cape Canaveral, Fla., late in 1963 or early in 1964. Manned suborbital flight is scheduled for the fall of 1964.

Dyna-Soar will be an expensive program, logically so because it involves a totally new concept of military operations. The total cost has not yet been determined but might exceed one-billion dollars.

The cost to date has been relatively slight, roughly $30,000,000 through the 1960 fiscal year which ended July 1. In fiscal year 1961, the Air Force will spend $58,000,000 on the project. As Dyna-Soar gets into the hardware stage, though, costs will mount rapidly. About $150,000,000 is programmed for 1962 and more than $200,000,000 for fiscal 1963. A complete test program will go through fiscal 1965.

Whatever the cost, military experts feel Dyna-Soar is a must. The Soviet Union has the capability for experiments like Dyna-Soar and military technology, as has been demonstrated by the dynamic advances of the last five years, will not stand still. Dyna-Soar's job is to explore the avenues of future space warfare, and this job, the Air Force feels, is vital to national defense. Dyna-Soar is a pathfinder on a long, long path to the future. END

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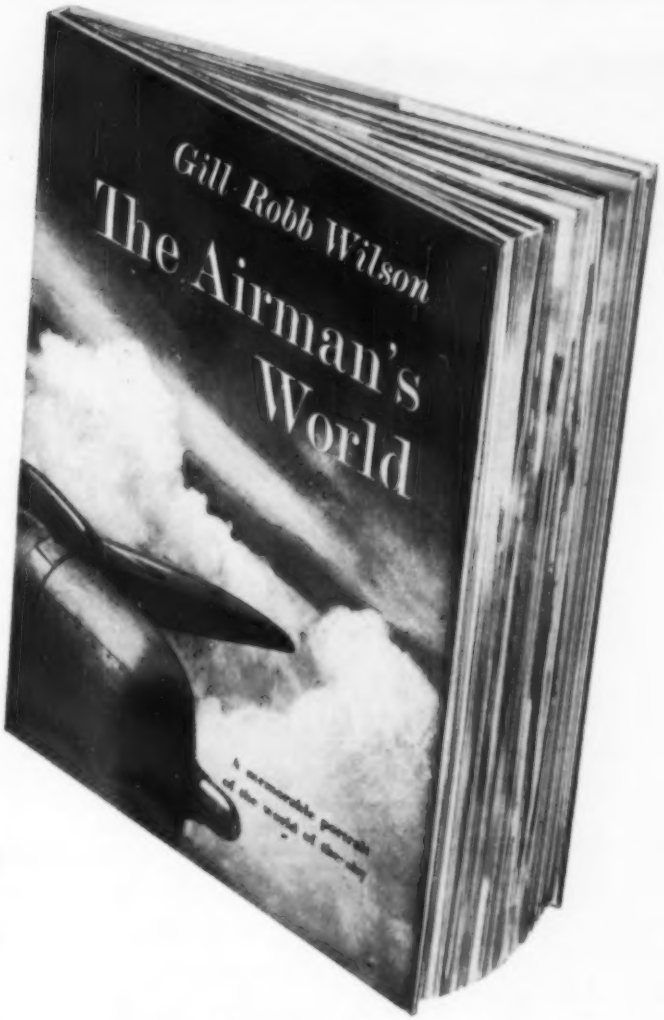

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A WORD ABOUT THE AUTHOR

Gill Robb Wilson was a pilot with the French Escadrille 66 in World War I, president of the U. S. Air Force Ass'n, president and organizer of many flying groups...and is now the noted editor and publisher of *Flying* magazine. He learned to fly just after the Wright brothers successfully propelled their flying machine above the ground, and has been one of the leading figures in aviation ever since. In his book, author Wilson conveys the feelings known only by men who are at home in the sky, and explains this exalting sensation to those who have never flown.

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Baroid's Air Fleet

(Continued from page 25)

to the general manager in Houston, Texas, smarted under the knowledge that the company was getting no more than an hour of productive time daily from each service engineer. The answer came out of his experience of four years flying for the Navy during World War II. Hood borrowed a float plane and used it for two days, flying to rigs working in protected waters.

"During those two days," he recalls, "I made more rigs than I previously had been making in a week." Hood called George Ratcliffe, now retired but then general manager of Baroid, and proposed to have floats put on a Taylorcraft which he owned. Ratcliffe agreed and Baroid's aviation department was born.

That was in 1946. Baroid became the first company to use float planes in sales and service work in the petroleum industry. Testimony is given to the effectiveness with which service engineers covered the rigs working in the marshes and bays by the fact that 18 months after the company put its men into planes, competitors also took to the air.

Baroid uses planes in strategic locations to reach rigs that are most inaccessible by other means of transportation. Two Cessna 170s and six Cessna 180s are stationed in South Louisiana. Seven of these are float-equipped for servicing rigs in the marshes and lakes. A Cessna 180 and a Super Cub, both equipped with skis, service rigs in the Peace River-Fort Nelson regions of Canada. Three light twins, a Beechcraft D18S and two Aero Commanders, operate out of the company's headquarters in Houston.

"In our business," says Coale, "service to the customer can be the difference between making a sale or losing it. Oil well drilling is an expensive and a hazardous venture. Our men are skilled service technicians, just as important at times as the driller on the rig crew. Our job is to keep that rig drilling at top efficiency and to protect the owner's investment. Our planes help us meet this customer need. Our faster, better service to these hard-to-reach rigs pays off for us in increased sales." By increasing the productive time of service engineers, Baroid covers more customers with fewer personnel. Fewer men can make more calls and at the same time give better service.

"One engineer flying in that first plane in Louisiana," Hood says, "was able to do the work of eight or ten engineers traveling by highway and boat to reach the water-based rigs."

Hood once made a good customer out of a hard-to-sell prospect by flying him to his rig in 20 minutes in an emergency.

"Our pilot-engineers work hard," Bill Miller, Baroid's aircraft supervisor and chief pilot, says. "They are in the air by daylight. They work a rig, return to their planes, radio in for any new instructions, then take off for the next location. Maybe a rig in the area has reported trouble of some sort. Our man is there in a few minutes. Otherwise he continues with routine service calls. By night he will have covered 15 to 20 rigs. Compare that with the one or two rigs made by a service

(Continued on page 68)

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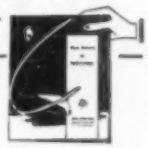

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(Continued from page 66)

engineer in southern Louisiana before we started flying!"

The emphasis placed on direct selling by Baroid can be seen in studying its log books for 1959. During the year, its planes logged 6,558 hours of flying time. Of this time, over 70 per cent was flown on missions directly connected with service to the customer. When compared with companies in other industries, this ratio of direct service time to other uses is high and is probably one of the biggest reasons why Baroid is convinced its planes are effective servicing tools.

Most of the remaining 30 per cent of total hours flown in 1959 also are related to the company's servicing program.

Administering sales and production staffs scattered over several countries also presents a complex problem. Management personnel in both the sales and technical branches of the company use the executive office planes stationed in Houston to make periodic trips throughout the field and for inspection and training meetings.

Scheduling comes under the supervision of Leon W. Huebel, operations manager. Various departments are appraised of proposed flights and requests are received for space. Huebel says a plane seldom takes off without a full payload.

Cost-wise, Baroid operated its planes at the following hourly average figure in 1959; Cessna 170 floatplanes, $24; Cessna 180 floatplanes, $32; Aero Commanders, $77; and the Beechcraft D-18S, $94.

Fully equipped hangar facilities are maintained at the plant on the Industrial Canal in New Orleans and at Andrau Airpark west of Houston. Mechanics are on duty at both locations. Planes are grounded after logging 100 hours, for inspection and overhaul. Baroid does all its overhauling except for radio, instruments, autopilot and engines which are put out on a contract basis.

Use of its aircraft fleet has enabled Baroid to extend the scope of its services to its customers and to retain its enviable position as sales leader in its field. END

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Even the most forgiving airplane can turn nasty if its gasoline diet gets contaminated with water, dirt particles and other non-combustibles. Perhaps you know and observe the precautions necessary to avoid fuel contamination in your plane. But, in the interests of safety, let's review the basics:

DRAIN FUEL SUMPS. Notice that plural: sumps. On your pre-flight, it pays to drain a few ounces, not only from the main gascolator, but from the wing tanks themselves. This gets rid of moisture and sediment that accumulates on the bottom of the tanks and does *not* get cleared out through the gascolator. (Quick-drains are now available as an accessory for most light planes that do not already have them.)

TOP YOUR TANKS. Make sure those tanks get filled *before* you put your plane away for the night. This will prevent condensation from forming on the inside walls of your tanks—the same type of moisture you often see on the *outside* of your plane early in the morning.

One more tip: use all your tanks. Avoid letting gasoline "sit" for month after month in an auxiliary tank. Keep your fuel "fresh."

Follow these rules and you'll help keep your plane's gasoline diet pure and healthy. Incidentally, you might be interested in knowing something about the systems your Gulf aviation dealer uses to insure delivery of absolutely clean Gulf aviation gasoline into your plane.

Notice another important plural: systems. That's because your Gulf aviation dealer has what amounts to *three systems* working in combination to keep the fuel pure. Here's how they operate:

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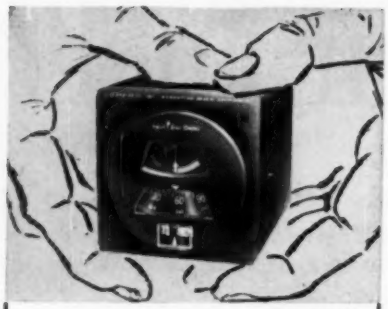

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HANGAR FLYING

CHRISTMAS GROUND LOOP

TO MAKE A LONG story short, I once used a technique by instinct for landing on an icy runway that might well be worth using on purpose if a similar incident ever happens again.

Our squadron of PB4Y-2 Privateer patrol bombers was operating out of the Naval Air Station at Kodiak, Alaska during the winter of 1947. Anyone will tell you winter in Kodiak is no picnic. Kodiak is notorious for the worst weather and being the roughest obstacle course of any air station that the Navy has. The landward approaches are ringed with high volcanoes and to seaward the runway ends in a sheer drop into the icy Buskin river. Each landing approach has to be perfect.

Christmas eve, the orders fell to us for a long night patrol in the 30 tons of various metals that the Navy ingeniously transferred into this flying machine. Orders are orders, despite Christmas eve, so we bundled up and took off into the night for an antisubmarine search. As our pilot poured the coal to her, he clamped down on his cigar, squinted through his goggles in the eerie red glow of the cockpit and growled "Merry Christmas" to the crew over the ICS.

It was a routine patrol with the routine boredom—I was copilot in those days. But from the instant we touched down on final after the mission was over, we were in the hands of the gods.

There had been a perfunctory caution from the tower about ice on the runway when we reported gear down at the 180. We thought little of it and continued the approach. The usual crosswind was from the right tonight, about 45 degrees from the active runway.

We were lined up nicely on final with a little extra power and airspeed to handle the cross wind. The runway lights reflected up cheerfully at us from the snow banks alongside the landing area and I was enjoying the view.

Touch-down was normal, but then we applied the brakes and nothing happened. The brakes locked and we skidded on helplessly, headed for the end of the 5,000-foot runway and a drop into the river. Christmas Eve was no time to die.

Without even thinking about it I reached over and applied power to the starboard engines. We started to ground loop and, after 180 degrees, when we were facing back the way we came, I pulled off the power and pushed up the port throttles. It stopped our rotation and now we were skidding backward down the runway. Now I applied power to the engines on both sides and this acted like a brake. It worked as though I had planned it that way, but the truth is I just had good instinct.

The tower called after we came to a stop and said "you are cleared back to the squadron area" as calmly as if nothing at all had happened. We crept back to the hangar and had a Merry Christmas indeed.

W. W. Mound, LCdr., USN
USS Shangri La (CVA-38)

A LESSON IN PHYSICS

SHOWING OFF can get you in trouble, I discovered when I took up my brother-in-law Lowell for his first plane ride shortly after I got my license.

On a warm spring day we headed for Pontiac airport where I made arrangements to rent a Cessna 140 from Barber's Flying Service. Ken Barber assigned us "856," and I swaggered off confidently to the hangar where she was sitting up on a nose dolly.

I was eager to impress Lowell since he had never been flying before, but remember I was still new at it. I made an extra careful check of everything on the plane, even some things that weren't normally part of the walk-around. I drained the moisture from the gas tank, took a visual check of the gas level in both tanks, studied the oil dip-stick, kicked the tires, turned the prop through once by hand (after first checking the master switch) and carefully explained everything to Lowell, who was taking it all in.

There was just one hitch. Getting the plane off the dolly was something I had never done before, though I had seen others doing it. I didn't want to admit that I couldn't, so I tried and got away with it. We wheeled the plane out of the hangar and climbed in.

I explained all the instruments and controls to Lowell and, after a careful preflight check and more loud explanation despite the roar of the engine, we took off.

We were in the air about 25 minutes and about 12 miles from the airport at 2,000 feet when the engine started sputtering. It couldn't be out of gas, I thought. I had checked the tanks on the ground. The switch was on "both" tanks and there was no gas splashing off the wings.

There wasn't much time to think about it; we were probably in for a dead-stick landing; it was my first, so I was a little nervous and so was Lowell. I spotted a farmer's field about one-half mile to my left and headed for it. Carburetor heat didn't revive the engine so I quit playing with the throttle and concentrated on getting us down.

For my first try, I didn't do too badly. We were at 1,000 feet at what I picked for a downwind entry point. The field looked level and big enough, with a clear approach, but there were some ominous-looking trees on the up-wind end. Turning into the base leg it looked high and fast, but easing the nose up slightly didn't help much. I was still high on final and

decided to side-slip. We touched down with room to spare.

A little unsteady at first, I climbed out and went to check the tanks. They were both almost full. I was baffled, so we walked across the road and asked a surprised housewife if we could use her phone. Hoe, the mechanic at Barber's Flying Service, heard the story and his first question was whether or not we had switched gas caps before taking off. When I said "Of course not, why?" he patiently explained what had happened.

Gas will leak through the air vents on regular gas caps when the plane is tilted up on a nose dolly. So rather than drain the tanks, it is a simple thing to replace the caps with an airtight variety. However, the original caps must be put back before flying the plane or physics will kill the engine. As gas is drained from the tank into the engine, air must fill the space or else what is called a vapor-lock will result. A vacuum develops and, when it becomes powerful enough to offset gravity, it chokes off the fuel supply to the carburetor.

Feeling sheepish, but having learned something the easy way (by living through it), I replaced the two vented caps which had been lying innocently inside the plane. I noticed them before take-off and figured they had been left by a sloppy mechanic.

GEORGE A. LUENBERGER
Clarkston, Mich.

OPERATION ASSIST

THE LIGHT haze that seemed so prevalent in the spring was in evidence on this particular April day as the Cessna 175 bore my father and me home to Austin, Tex., from a trip to Sewanee, Tenn.

We had VFR reports all the way and everything was serene as we began our last 100-mile leg. The pilot, Scotty Bledsoe, a relative of ours and a fixed-base operator, was patiently explaining the Omni to this eager young aviation aspirant who had been attempting to navigate the past 600 miles.

As Scotty tuned the VOR receiver to College Station, with few explanatory remarks to me, he suddenly turned up the volume and held up his hand. After a few seconds, he grabbed the sectional from my hands began to scan it rapidly and called College Station radio giving them our position.

Only then did I find out what happened. A Bonanza was lost in the area with a door open. The aircraft was not in immediate danger, but the open door did constitute an emergency and the pilot wanted to land at College Station. He was lost, however, in the vicinity of the Brown Ranch which is north and east of College Station. Scotty informed the radio operator that we had just passed over the area and offered his assistance. The operator asked whether we had the Bonanza in sight to which Scotty answered, no, but added that he would look for it. We made a slow 360-degree turn, squinting against the haze, but to no avail. Finally Scotty inquired, through the College Station radio operator, if the

(Continued on page 72)

Painting by Douglas Ettridge

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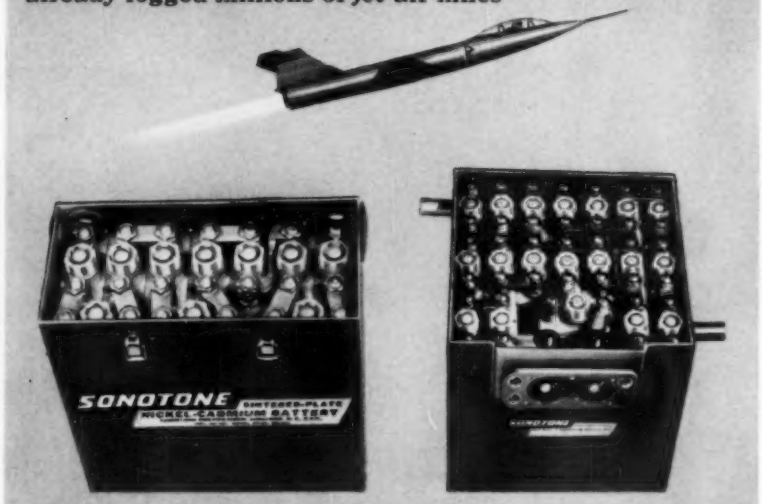

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(Continued from page 71)

Bonanza saw smoke several miles away at Bryan. The reply was affirmative and a rendezvous was arranged over the smoke.

As we proceeded in that direction, we saw the Bonanza coming across our course from the right. We altered course to intercept him and flew off his right wing toward College Station. When he caught up and passed us we could see the door slightly ajar.

College Station radio informed us that he had the airport in sight and was starting his approach. From our position, it was apparent that he had mistaken Bryan AFB for Easterwood Field. We informed the College Station operator of this and suggested that the Bonanza pilot change course 90 degrees in order to line up with Easterwood. This was promptly done and our offer to follow him down deemed unnecessary. We relaxed and altered our course for home.

The College Station tower operator was most appreciative for our assistance and thanked us. Scotty's reply was: "No trouble at all. Maybe he can do the same for me sometime."

CHARLES A. SUMNERS JR.
Sewanee, Tenn.

Missiles and Airman's World

(Continued from page 23)

Saddled with the job of reconciling these extremes is an intense, 40-year-old command pilot, skipper of the outfit. To the colonel, Snark is a tremendous challenge, a beginning of something which has no limits. He endorsed the feeling of several subordinates that the Snark, by the very fact that it depends on guidance all the way to its target, has more to teach the crews than any of the newer rocket-powered ballistic missiles.

"I don't want to over-emphasize the economic aspect," the colonel stated, "but it is one that must be taken into consideration. Some of the more extreme feeling among the pilots is, I think, traceable to losing flight pay."

Doubtless this is true. But I don't think the colonel could have applied it to the F-100 pilot. That man's attitude was summed up in the statement, "I joined the Air Force to fly." The sincerity of this position is borne out, oddly enough, by the sentiment of some among those farthest removed from the flight line or the missile pad.

"I'd rather be back in a fighter squadron any day," a clerk commented. "I was only a clerk in the engineering section, but I rubbed shoulders with the fighter pilots. I could see the planes land and take off. If I wanted, I could go out and pat them."

The Missile Squadron conducts an orientation for all newly assigned personnel, making certain that they have the sixty-four-dollar tour. Apparently, however, looking at, or even patting a missile that may never take off, leaves something to be desired.

From the aura surrounding missiles in the public imagination, one would presume that any man in the Air Force would

be tickled pink over assignment to such an outfit. Why, then, the near-violent reaction of many pilots, and even of clerks, cooks, and bakers?

Probably the answer lies deep in the variations of human temperaments. It frequently is said that once flying gets into the blood it stays there. I doubt that this is the proper way to state the case. Flying does not get into the blood. Flying is just a perfect outlet for the energies of men who are born with, or have acquired by association, certain characteristics of temperament.

What flight involves—action, physical challenge, self dependence, stimulation of danger, a certain sense of freedom, a certain artistry of airmanship—these are the things many men have in common. Some can know them individually and others only vicariously but under their skins the jet jockey and the clerk who loves to pat the sweptwing fighters are brothers.

On the other hand, there are individuals who find their satisfactions in other segments of the temperament spectrum. Action only interferes with their meditations and concentrations. Their excitement is no less real but it stems from other sources than physical flight.

Naturally, there is no sharp cleavage in many cases. Many individuals cross the line in both directions. Some of our most brilliant pilots have been superb technicians as well, and visa versa.

To this observer at this point it seems evident that the job of the missileman versus the airman is an acute projection of the job of the fighter pilot versus the bomber pilot or the job of the ground crew versus the flight crew. The only thing of which we can be certain is that the problem is no simple one of changing assignments from one outfit to another.

Individuals must be dealt with as individuals, and, perhaps, this is an unexploited gold mine of military effectiveness.

Intelligence and Operations personnel who once plotted courses, analyzed enemy opposition, and briefed combat crews, now largely dust off course tapes. Much the same is true of the operating crews. They do not know their targets, have no need for survival or evasion training and, in general, face nothing more demanding physically than the leisurely walk to work, and back.

In short, the let-down from the dramatic to the humdrum could not be more complete.

The heart of this particular operation is in several aluminum sheds, each about three stories high and a block long. Connected to the sheds are concrete launch pads, each 100 yards in diameter.

At full strength, the squadron will have more than a score of missiles and a little more than one crew per missile. The "birds" are lined up in tandem inside the sheds. Electricians and jet-engine mechanics work directly on each missile. A launch officer and his electronic technicians monitor the progress of maintenance and the count-down from a balcony overlooking the missile.

(Continued on page 74)

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(Continued from page 73)

The count-down is a continuous affair. As the first missile in line is readied for launch it is moved out onto a launch pad. The engine is run up. Then, at the point of launch, the whole process ends. The missile is trundled again to the building. The maintenance check and count-down start all over. To achieve 24-hour readiness, the squadron has instituted a shift operation whereby each crew will eventually work six days on and two off. Crews will change shifts at least once each month. The shift system is not yet in full operation due to the fact that many crews are still in training. As each of these completes its training it is checked out by a standardization board crew, much as the "standboard crew" of a bomb wing.

Most crews have launched at least one Snark down the Atlantic test range from Patrick AFB. Whether they will be able to return for successive practice launchings remains in doubt, for obvious reasons of cost. Cost notwithstanding, however, launchings, or the lack of them, are the heart of the missile morale problem, just as the frequency, or infrequency, of firing was with the Coast Artillery. A former B-47 squadron commander, now a senior launch officer of this squadron, has participated in many full-scale Snark launchings.

"How long you can sustain interest without actually firing is a good question," he admitted. "Certainly, there is a bad psychological reaction in a situation where you are forever building right up to the point of take-off, and then stopping short."

"In other words," I interjected, "in which every mission is an abort."

"Well," the major admitted reluctantly, "that is just how I would look at it as a bomber pilot."

This feeling does not affect the technician for the simple reason that his interest begins and ends with the missile itself. This is true to such an extent that one Northrop technical representative commented, "When you do fire one off, you feel as though a part of yourself was going off with it."

Of those with whom I talked, only one pilot, outside the command echelons, could have been said to share the outlook of the technicians.

"In this work," he said, "every problem stems from a different source. Every solution teaches something new. I've used everything I ever learned about aerodynamics, navigation, engines as well as electronics."

Even this officer, however, pegged enthusiasm for missiles to a continuance of flying status.

It would seem reasonable to conclude that, for the majority, both rated and nonrated, participation in actual launchings, at some reasonable interval, will be the key to sustaining interest. For all of the rated personnel, the additional provision of adequate flying time and facilities is of equal importance. Lack of flying facilities at this and other similarly converted bases results in deterioration of flying skills obtained at enormous expense and irreplaceable time.

Drastic as the change from a flying unit to a missile unit has been for many of the pilots, it appears to have affected their wives and children little, if at all.

"Dan is a Reservist, and I think this assignment is important to him," the wife of a Snark launch officer observed. "As for his flying, though, I feel safer when he is doing a lot of it than when he flies infrequently. There really hasn't been much change in the family routine," she continued. "What with training and all, Dan has been working just as long and hard as he did in a fighter squadron, but I think that will change when his crew goes onto a definite shift."

The problems of adjustment discussed here are not peculiar to this squadron. Similar problems await every permanently emplaced strategic missile unit.

Most problems can be solved by common sense and sound command policies; and by decent family housing.

The biggest problem of all, however—how to preserve the spirit that has made the Air Force great—will require a tremendous amount of study and imagination. It certainly is not going to be solved by clearing away every military aircraft for 20 miles around.

Technicians are essential to the day-to-day safety of the nation. But the future of the nation depends on the qualities of personal daring and vision that have long been associated with manned flight. Those qualities cannot exist apart from the environment that produced them. END

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Aero Commander 500A

(Continued from page 27)

of one side of the air intake for each engine has been closed off.

The thin nacelles never would have accommodated the wheels without rotating them into a horizontal position. The 90-degree rotation is accomplished by a single offset link that turns the center body of the gear as the wheel moves rearward into an extension of the nacelle, aft of the wing trailing edge. Uplocks have been added to prevent any vertical motion of the wheel in rough air. Cowling doors, which are double-walled for strength, are hinged along the bottom and held in place by quick release catches for easy access to the engines and accessories. The catches are adjustable to insure a tight fit for the life of the airplane.

Removal of eight bolts allows the rear section of the nacelle to be removed for inspection of the landing gear mechanism and cowl-flap motors.

The Continental engines are equipped with a low-pressure fuel-injection system. Continental worked closely with Aero Design to develop a flatter engine for the 500A so the thin nacelles could be used. Relocation of the oil dip stick allows checking of the oil level while standing on the ground.

The primary purpose of the redesigned nacelle and landing gear is to reduce drag and increase lift. Drag has been reduced some 12 per cent, which has increased single-engine and take-off performance. At the same time, the stall speed has been reduced about five mph.

To the uninitiated, the Aero Commander may appear to be lightly equipped with radio gear, if the number of visible antennas are used as a guide. The cap of the vertical stablizer and the wing tips are of fiberglass, making them transparent to radio waves.

The antennas for VHF communication and navigation are installed in these areas, out of sight and where they will not produce drag or icing problems. The only visible antenna is the sense wire for the ADF.

The hydraulic system includes two engine-driven pumps, an electric pump that replaces the former hand pump, and a pressure accumulator. A single 24-volt battery is now used in place of the former two units. It was specially designed for Aero Design, costs considerably less and saves 52 pounds in weight. Dual 50-ampere generators and dual vacuum pumps are installed as standard equipment. Electric fuel-boost pumps are used for starting, take-off and approach. They will operate automatically whenever the pressure drops below 500 pounds.

Demonstrator N9384R was the first 500A delivered to Santa Monica Aviation, Cal., and was painted white with blue trim with a narrow red line outlining the blue. The interior was of blue leatherette with fabric inserts on the seats of a beige color. The interior is only a little less impressive than the more expensive Aero Commanders. This airplane was equipped with six identical, individual, wide comfortable seats which adjust fore and aft on rails and have re-

(Continued on page 76)

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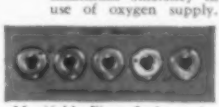

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(Continued from page 75)

clining backs. Headrests are also available. The removal of the hand hydraulic pump has cleared the floor area, making cockpit entry much easier.

Throttle, propeller and mixture control knobs are of individual design, allowing for the identification by feel alone. Friction locks are included. The mixture controls are equipped with individual latches to prevent their inadvertent movement. The landing gear retraction handle is on the instrument panel above and to the right of the engine controls. The flap lever is on the right and low on the control pedestal. The carburetor heat controls are located below the pedestal. Gear and flap lever locations correspond to military and commercial airline requirements for new aircraft. All electrical and starter switches are located overhead in one row. Starter switches are now integral with the ignition switches. They are spring-loaded so they move back to "both" when they are released from the "start" position. Elevator and rudder trim cranks also are located overhead. Starting procedures are simple and both engines were started quickly and easily.

I've ridden right seat in a Commander before but never steered one on the ground. Moving the rudder pedals does nothing except on the take-off roll. This is due to the nose-wheel power-steering system being operated through the toe brakes. The first bit of pedal travel operates the power steering and pressing them in further activates the brake. This is something you don't get used to in one trip around the airport but I am sure that, once you get the hang of it, you'd like it. The system might be easier to operate if the pedals were locked during taxiing so that you couldn't operate the rudder, but only the power-steering and brakes.

Along with this pilot was A. W. "Duke" Effinger, sales manager for Santa Monica Aviation. At take-off, airport elevation 175 feet, our 500A grossed about 5,555 lb. A stratus cloud layer sat about 800 feet above the deck, and our instrument departure was coordinated with the Los Angeles tower. When our clearance came through we decided on a short-field take-off to initiate this flight. Taxiing close to the boundary, the airplane was lined up and full power applied. The 500A was easy to control with rudder only and it accelerated rapidly. By the time we were abreast of the tower, which is less than 450 feet from the end of the runway, we were generating 65 mph. Minimum single-engine control speed is 70 mph. There was no question about its being ready to fly, but I must have had the wheel well forward of center and, not wanting to pull it back too quickly, we didn't get the short-field take-off we'd planned.

As the airplane rotated we were doing 80 mph and I started to drop the nose to accelerate to 140 mph, best for initial climb and single-engine performance, but Duke's heavy hand was on the wheel. At the same attitude the speed was up to 125 mph indicated in a matter of three or four seconds, where I held it until we broke out at 1,200 feet.

About 1,500 feet over the Pacific Ocean we purposely did everything wrong. Losing an engine on take-off calls for feathering

the propeller, bringing up the gear and maintaining at least 95 mph. We allowed the left propeller to windmill at zero thrust and, with full power on the right engine, extended the landing gear and pulled the airplane nose high.

About 12 degrees of aileron, plus light pressure, held the heading. Control forces were lighter than I had expected. The nose comes way way up before the stall occurs at about 55-60 mph indicated. I was prepared to chop power on the right engine if it started to roll but there was no tendency in this direction at all. The 500A fell straight ahead. All I had to do was relieve some control pressure.

We tried several other stalls in various configurations. In each case there is sufficient buffet to warn you that a stall is imminent. Because the nose must come up so high, I question that it would be easy to get this airplane into a critical attitude. If it did stall, recovery would be quick. (Don't get the idea that a stall close to the ground in this airplane is not dangerous; such a condition is dangerous in any airplane.) I attributed the ease of stall recovery to the fact that the 500A has large control surfaces, the same as the more powerful models, but with less power on the operating engine.

With the left propeller feathered and 65 per cent power from the right engine, we were indicating 125 mph at 4,000 feet. With feet flat on the floor, and the airplane trimmed, I made several steep turns to the right and left without any tendency for the airplane to get away from me, following which we restarted the dead engine.

When the right-hand cylinder-head temperature came up to normal, we continued our climb to 8,000 feet, using 23½ inches and 2,300 rpm (75 per cent power). Passing 6,000 feet, we were indicating 140 mph and ascending at 800 ft./min. At 125 mph the rate of climb was close to 1,000 ft./min.

Leveling off at 8,000 ft., we set up 21½ inches and 2,300 rpm, about 60 per cent power. Indicated speed was 180 mph which, with outside air temperature 18 degrees C. (65 degrees F.) gave us a true airspeed of 208 mph. Fuel consumption was but 20 gal./hr. The Commander is yellow-lined at 230 mph and red-lined at 290 mph. The 60-mph margin makes a critical position difficult. Positive limit load factor is 3.6 Gs.

At maximum cruise the 500A burns 14.5 gallons an hour. Duke set up 45 per cent power and the fuel pressure for 14.5 gallons per hour. The indicated airspeed was 160, or 185 mph true. Then he leaned the mixture as you would without a pressure gauge, listening for a drop in rpm or for any roughness. Fuel consumption dropped to 13.5 gallons per hour. This is below the green area on the gauge, but the cylinder-head temperatures never were above 150 deg. C. and in the green.

Next, Duke had me trim the airplane for level flight at 65 per cent power. We both took our hands from the controls. Duke then lowered the gear until the speed dropped to 150 mph, where he could extend half flaps. The airspeed went down into the white area of the indicator and then he applied full flaps. We were now indicating 130 mph and at no time had the

(Continued on page 78)

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(Continued from page 77)

nose moved even a degree from its position when we started slowing down. The airplane was still in a level attitude.

There is no need to start slowing this airplane down when still miles from the airport. You can approach at cruise speed yet slow it down in a matter of seconds. I'm surprised that the maximum gear extension speed is 180 mph. With the wheels flat to the airstream as they start out of the nacelle, you would expect that strong forces would build up that would limit gear extension to 130 or 140 mph, except in an emergency. The 180-mph limit makes the gear useful as a speed brake.

We were now over Santa Catalina Island, about 20 miles off the coast, and Duke suggested we drop down for a cup of coffee. Bringing up the flaps but leaving the gear extended, we closed both throttles and dumped the nose. Holding 180 mph we were losing 3,000 ft./min., indicating that you can get this airplane down in a hurry. The Catalina airport is situated 1,500 feet above the water and was constructed by leveling off two hills and filling the valley in between, so that the runway ends at a steep slope that continues down to the water's edge. Duke advised me to fly the airplane in the pattern much as I would a single-engine ship but to keep up the speed until we were on final. I tried to rack it around onto base and the aileron controls, though responsive, seemed a bit stiff. But I found that aileron juggling is not necessary in this airplane.

I rolled onto final and chopped the power, thinking I was too high as we were trying for a short landing. About 1,500 feet from the end of the runway I decided I'd better add some power or we'd dig a hole in the cliff at the runway's end. But Duke stopped me and soon it was apparent that I had grossly underestimated the gliding capability of the airplane. Even with half flaps the glide was shallow and I had to dump the nose to get it on short. Rounded out at 80 mph, the 500A had a tendency to float. We used only about 1,000 feet of runway, without braking.

After a cup of coffee we took off again and headed to the mainland, checking the single-engine climb along the way, which ran to an indicated 115 mph and 400 feet a minute as we passed through 4,000 feet. Restarting the idle engine, we continued our ascent to 10,000 feet. At that altitude we feathered a propeller again and even managed a little climb. Service ceiling, single engine, is specified as 10,000 feet. At this point, we feathered the other propeller. Was it quiet! Airspeed was held at 125 mph. Even so, it took a full 10 minutes to lose 6,000 feet. The attitude of the airplane was almost level. Restarting the engines at 4,000 feet we were able to hold that altitude at 125 mph with 12 inches of manifold pressure.

We headed back to Santa Monica with the overcast still hanging from the coast island, so we had to go under, using a flat power-on approach. I was maintaining 105 mph against the possibility of losing an engine when Duke feathered the right propeller about 1,500 feet from the end of the runway. There was no problem with directional control or a short-and-slow landing, though I didn't trim the Commander.

This airplane, which was equipped with a Dare DTR-360 communications transceiver, Dare DN-560 navigation receiver, Dare DADF-1 ADF, Dare glideslope and marker receivers and a Flitronics cabin amplifier, had an empty weight of 4,200 pounds. With full tanks (156 gals.) it can carry five people and 30 pounds of baggage or four people and 200 pounds of baggage. With fuel for a four-hour flight, plus 30-minute reserve, the 500A will take two additional people and their baggage. Hourly operating cost of the 500A is estimated as $18.75. END

Aero Commander 500A

Specifications and Performance:

Height	14 ft. 6 in.
Length	35 ft. 1.25 in.
Wing span	49 ft. 6 in.
Wing area	255 sq. ft.
Wing loading	23.6 lb./sq. ft.
Power loading	11.5 lb./hp.
Empty weight	4,075 lb.
Useful load	1,925 lb.
Maximum gross weight	6,000 lb.
Fuel capacity	156 gal.
Baggage compartment	41 x 47 x 31 in.
Gear tread	12 ft. 11 in.
Maximum speed (sea level)	230 mph.
Cruise speed (70% power, 10,000 ft.)	220 mph.
Cruise speed (75% power, 5,000 ft.)	206 mph.
Stall speed (gear and flaps extended)	61 mph.
Range (45% power, 10,000 ft., 181 mph. TAS, 30 min. reserve normal fuel)	1,800 mi.
Service ceiling	23,500 ft.
Service ceiling (one engine)	10,100 ft.
Rate of climb (sea level)	1,570 fpm.
Rate of climb (single engine, sea level)	430 fpm.
Take-off distance (over 50 ft.)	1,200 ft.
Landing distance (over 50 ft.)	1,130 ft.

(Based on full gross weight. Speeds guaranteed plus or minus 3%. Climbs, ranges and altitudes guaranteed within plus and minus 8%.)

Instrument Flight Training

(Continued from page 41)

prevalent and persistent misconceptions in flight training. Especially is this seen in the usual "instrument refresher training" given to certified pilots.

In all too many cases the instructor pilot begins refresher training by having the student work a problem in radio navigation. Now, the student may not have forgotten the knowledge of how to work the problem, but if he needs refresher training at all, it is a safe bet that he has gotten "rusty" in his basic instrument flying. Skills are much more quickly lost than knowledge. And the higher the skill level, the greater the continuing practice required to maintain it.

Consequently, the student struggles in vain to hold speed, altitude and direction (probably through overcontrol of pitch, bank or power). Result: He "fouls up" his navigational problem completely.

So what happens? The instructor pilot says, "You need more radio-range instruction, let's try it again tomorrow!"

What the student really needs, of course, is to go back to some intensive review and practice in precision control of the aircraft by instrument reference. Only when this skill is restored can he hope to navigate the aircraft efficiently.

Basic instrument training is a matter of manipulative skill. Radio navigation is more of a matter of knowledge and problem solving. Skills must be "automatic" and habitual—a matter of conditioned reflexes quite different from the delayed responses and critical judgment required in navigational problems.

Incidentally, you would think that even if the instructor does not know it, that the "expert" pilot receiving refresher training would recognize his own weakness in basic instruments. But in too many cases, the more expert they are supposed to be, and the rustier they are, the less they recognize it, and the more "offended" they become when they are told the truth. Beginning students, on the other hand, can not be expected to determine the areas in which they are weak.

So in all cases, the instructor must be the one to understand and remedy this all too prevalent training deficiency. He can only do so by a thorough check *in all cases* of the student's level of precision in basic instruments prior to giving instruction in any other phase of instrument work. This includes, where appropriate, checking the student's basic instrument ability in emergency maneuvers, such as engine-out go-arounds.

2. In all instrument training the student must be well motivated and must be taught concepts, principles and objectives in addition to technique.

In contact training the student "sees" directly and instantly the result of pitch, bank and power changes caused by control movements. Perhaps this is why contact training largely has been an imitative process. The instructor executes a maneuver and the student "imitates" the instructor's control technique.

Needless to say, this does not work in instrument training. Flight instruments must be "interpreted," and related to each other and to actual aircraft attitudes. For example, the artificial horizon may be "read" directly, but aircraft inertia results in an "apparent lag" in the airspeed. Consequently, in "reading" the airspeed, trends and rate of change become more important than its reading at any instant.

Briefly, the student must be given the theory as well as the technique of aircraft control by sole reference to the flight instruments.

Again, if the student has had only contact flight instruction, the longer instrument instruction is delayed, the more the student may resist or fear instrument flight. It "goes against the grain." A good instructor will be careful to point out that instrument flight is merely contact flight "once removed." The aircraft's attitude is merely seen through the intermediary of instruments. In both cases the stimulus is visual. The student is not "blind." Blind men can not fly.

The good instructor also will motivate the student by explaining and demonstrating the reliability, safety under adverse visibility conditions, and the precise control obtainable by instrument reference. He will point to the fact that the student always has been using flight instruments to some extent in his contact flying—for example, the airspeed for approaches and the altimeter for accurate altitude. Such analogies with contact flight will allay somewhat the student's fears and make the transition seem more "natural."

In summary, we do not learn what we do not value or do not want to learn, and we do not learn well what we do not understand. And we can not teach well what we do not value and have not, therefore, learned well.

3. Lack of continuous "scanning" of all flight instruments, and overcontrolling the aircraft, are the two worst faults in basic instrument flying.

"Keep those eyes moving, and quit horsing the airplane around" might well, I think, be tattooed on every instrument instructor pilot's forehead!

Continuous scanning of flight instruments, or "instrument coverage," is the very heart of instrument flying technique. Concentration on one instrument can be fatal, such as ignoring bank or turn in favor of airspeed. Demonstrate repeatedly the value of instrument coverage to the student, and make sure he does not "backslide." Fine him a buck every time he does.

(Continued on page 80)

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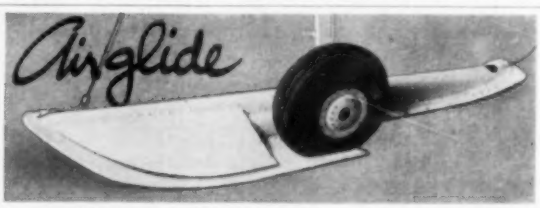

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(Continued from page 79)

Overcontrol may be related to fixation on one instrument or may be caused by tenseness, or "trying too hard." In any event, failure to relax physically while keeping mentally alert makes overcontrolling practically inevitable. In interpreting the instruments affected by aircraft inertia, this results in "chasing the instruments," which in turn makes for a worse case of overcontrolling.

We learn to float simply by not doing anything to keep us from floating! Something approaching this concept applies to flying. For example, in thunderstorm flying "fighting the controls" in an attempt to overcome gusts is poor technique. Let the aircraft "ride it out" whenever possible.

In "normal" instrument flight (unusual positions or other emergencies excepted) only small attitude or power changes are required. Usually, the less changes that have to be made, the smoother and more precise the flying. Airplanes often are more stable than humans!

Finally, I hope it can be seen how the foregoing three concepts "fit" into two even higher generalizations (1) Never take anything for granted and (2) Know your own limitations. These apply to instructor and student alike. As far as the instructor (the responsible party) is concerned, they may be translated thus:

1. Never take for granted the student's basic instrument flying ability, or that the student knows what he is about.
2. Never try to teach what you do not know and thoroughly understand yourself.

If you like teaching, understand your subject, and your's and your student's objectives, then you can be assured that you are in the right profession. END

Every Town Can Have An Airport

(Continued from page 35)

access to the air ocean is letting progress pass it by, just like the towns and cities a century ago that missed out on getting rail service. Those linked to the Iron Horse forged ahead; those which were not, could not keep up with the nation's over-all growth.

Now, the amazing thing is that it requires very little expense to get any town on the air map; much less, for instance, than building a single mile of paved highway, which can run from $15,000 to many hundreds of thousands of dollars. This may startle the many people who think of airports only in terms of multi-million-dollar projects with 5,000-foot paved runways in several directions, taxi-ways, terminal buildings and the like.

A small community, even a small city, needs nothing like this. For as little as seven acres of virtually unimproved ground a community can have a satisfactory airport!

That would be enough to provide a strip 100 feet wide and half a mile long, plus an aircraft parking area. That's all that's needed as a starter. (At high altitudes a somewhat longer runway would be required.)

The tricycle landing gear has done much to make this modest investment or lease of land sufficient for any community. No

longer is it necessary to plan several runways so that landings and take-offs can be made into the wind. The tricycle landing gear permits safe operations, even by inexperienced pilots, cross-wind.

This has an important bearing on the economy of acquiring land for an airport and also finding a suitable location. If two half-mile-long runways are to be built at right angles to each other a considerable amount of land is required. It means, in effect, locating a plot of ground at least a half mile square which is fairly level or can be graded for two cross-runways. In hilly or rolling country or in communities located in valleys, this could present a serious problem.

In certain hilly areas, it is sometimes difficult to locate even one strip of unused ground at a convenient location which is level. Much overlooked in airport planning is the fact that a gently sloping runway has many advantages and is entirely practical for small-aircraft operation. It is a known fact that an airplane, even landing with the wind, will stop very quickly if it is rolling up hill. It is also a fact that an airplane will reach flying speed very rapidly on a downhill take-off regardless of wind. It is entirely feasible, therefore, if a community is in hilly country, to plan on a single strip running up a gentle grade. The length of the runway also can be considerably less than might be required on level land.

A landing strip built over the crown of a hill is also perfectly practical. This would permit uphill landing and downhill take-off in both directions.

In any consideration of an airport site, convenience to town is a most important factor. The strip should be located as close to town as possible, and preferably along a highway, for quicker ground transportation.

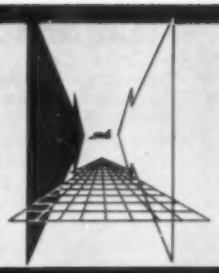
The fact that it is entirely feasible to locate an air strip on a slope makes such a close-in location practical, even in many hilly areas.

Any small community planning an airport should start out with the minimum investment possible. I don't think draining, paving, hangars, or even fuel service are necessary at the start. As the need grows these will be justified and will come automatically. But nothing could be worse than to see a heavy investment in the airport and only an occasional airplane landing there. Let improvements come later as activity increases.

In most instances, ground can be selected which need be marked off only with some handy native materials to indicate the runway. Erect a wind sock to show wind direction, and you have an airport. A little work by a bulldozer will smooth out a 2,500-foot strip in short order.

The range of modern private airplanes is sufficient to make the availability of fuel unnecessary. However, it would be most desirable if a strip could be located along a highway adjacent to a filling station. Aviation fuel could be handled and sold by filling station personnel already there. Telephone service and shelter would be provided automatically. For a long time, this would suffice.

(Continued on page 82)



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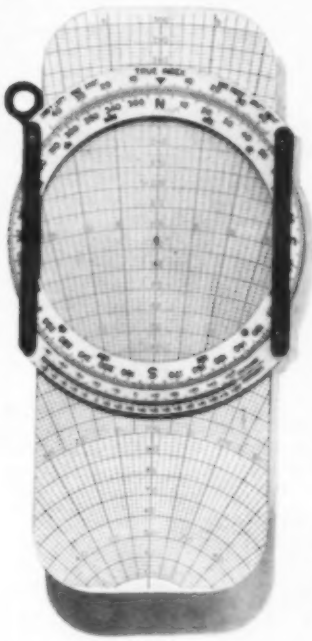

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(Continued from page 81)

As local individuals acquire airplanes, individual hangars can be constructed. Eventually, an airport service operator can locate to provide maintenance, charter, flight instruction and other services.

The benefits of a landing strip to a local community are probably too well known to the readers of FLYING to be dwelt on at length. But let's briefly review the basic reasons:

1. A strip links the small town to the outside world; brings the bigger cities and marketing centers within minutes, not hours, of the community.
2. People can visit the community with greater ease, to visit friends or do business.
3. This two-way increase in accessibility can have an important effect on the business and industrial growth of a community. More and more, business firms are locating new plants only in communities which have airport facilities. New industry and more employment mean more business for local firms, grocery stores, hardware stores, automobile dealers—the whole community. Likewise, local firms can expand the area in which they do business if sales and service personnel can fly to see customers rather than drive.
4. An airport puts a community on the "airline map," bringing airline-served airports, where connections can be made with the fast, long-range transports, within minutes.
5. In the event of emergency, medical aid and disaster assistance can be quickly rushed in. Critically ill or injured patients can be whisked off to medical centers.

These are but a few of the benefits which accrue to a community with an airstrip.

For all of us who use and fly airplanes, there is much to be gained by the building of more strips. We get a tremendous amount of utility out of our airplanes now, but we can get so much more if we can land more places. As yet, we often don't use our airplanes for really short trips of, say, 50 miles or less. The ground time between point of origin and the final destination nullifies the basic efficiency of our aircraft. If practically every town had an airport, we could start using our airplanes for the majority of our travels, which are the short trips. Our planes' utility would go up tremendously.

The telephone is a case in point. If there were only two or three other phones in your town, you wouldn't get much use out of your own phone. Now that everyone has a phone, it's one of the most useful inventions we've ever seen introduced. The same will apply to the airplane.

If we had twice as many airports, 12,000 of them instead of 6,000, our airplane's usefulness would be more than doubled; it would go up by the square. And that's what I think all of us in aviation are striving for—more utility—whether we're private owners or are counted among the thousands of aircraft owners who now rely on their airplanes to speed business travel.

I think all of us active in aviation should make a concerted drive in our own areas to see that landing strips are put in to serve every single community that counts itself alive and progressing. Not fancy paved runways, not expensively engineered sites; just seven-acre strips, 100 feet wide, 2,500 feet long, perhaps with room to expand. Make sure they're reasonably smooth, put simple markers at the ends and along the boundaries, put up a wind sock, and let the inevitable growth of private flying take care of future development. END

Guide To Nav-Com

(Continued from page 46)

all others. Suppose the megacycle selector crystals operate from 78.0 to 86.0 megacycles and the tenth megacycle selector crystals operate from 40.0 to 40.9 megacycles. To transmit 123.4 merely requires that the 83.0 and 40.4 crystals be selected by their respective switches. As the megacycle switch is turned to select the 83.0 crystal the mixer output circuit is automatically tuned to accept, or pass, frequencies between 123.0 and 123.9 mc and reject all others. The sum of 83.0 and 40.4 is 123.4, which will be passed and then amplified further to produce the output signal.

Digital-tuned receivers operate in somewhat the same manner. Let's consider the continuously tunable receiver first then come back to digital tuning. The excellent selectivity and sensitivity of the modern radio receiver is possible only because most of the amplification takes place in fixed-frequency amplifiers, termed "IF," for intermediate frequency.

How, you ask, do we arrive at a fixed frequency in a tunable receiver? We use a mixing process similar to that described in the preceding paragraph on digital transmitters; however, one of the frequencies is supplied by a variable frequency oscillator, tuned by the tuning control of the receiver, and always operating at a lower frequency than that indicated by the dial—for instance, always 10.7 mc lower in one make of receiver. The other frequency is the station signal, already amplified by other circuits, also tuned by the tuning control. When these two signals are injected into the mixer, the difference frequency is 10.7 mc, which is selected and amplified by the IF amplifiers. In a digital-tuned receiver the process is more complex, but in short, the crystals provide the frequencies to be mixed with the station signals. The problem with the tunable receivers is mostly one of stability. The tunable oscillator often drifts with temperature and time, so that dial calibrations are not always reliable. Crystal oscillators, on the other hand, are extremely stable under the same conditions so that one can be positive the receiver is tuned to the frequency indicated on the dial of a digital-tuned receiver.

Omnirange instrumentation is a complex system. The complexity is warranted by the simplicity that this system has brought to aerial navigation. Referring again to Fig. 1, it is easy to see that the variable signal is displaced from the reference signal by an increasing amount as the receiver is moved around the station. Automatic bearing indicator types of Omni equipment measure this difference directly and display it as a

magnetic bearing on a circular dial much like an ADF, but without reference to heading. Left-Right meter types are universally accepted and a detailed description of airborne Omni systems will be restricted to this type.

Refer back to Fig. 1 for a moment. On the zero-degree radial the two 30-cycle signals are in step or, more properly, in phase. On all other radials they are out of phase by an amount called the phase angle; the bearing angle from the station and the phase angle are always equal. If the receiver is 144 degrees magnetic from the station the phase angle will be 144 degrees.

The first requirement for an Omni converter-indicator system is a circuit that will measure a small change in phase angle, as a result of drifting off course, and display this change as a deflection of a Left-Right meter. A phase discriminator performs this function, but is useful by itself only on the zero- and 180-degree radials. To operate on other radials, some means must be provided to shift the phase of the variable-phase signal, so that it has the same relationship to the reference phase as that received on the zero-degree radial. The Omni Bearing Selector controls a circuit that can perform this function and provide any amount of phase shift required. So, if the 65-degree radial signal is being received, the pilot turns the OBS until the L-R needle centers. The calibrations tell him how much phase shift he has inserted, which he reads as a bearing. However, he does not know if the bearing is To or From the station since the L-R meter will center with the OBS on 65 or 245.

Let's assume a position on the zero-degree radial and see how we can go about solving this ambiguity. As the OBS is rotated clockwise from zero, the needle will move full right at 90, center again at 180 and move full left at 270. From 90 to 270 is a change of 180 degrees, exactly the amount of phase change obtained by moving from one side of the station to the other. If a second phase discriminator is employed, inserting 90 degrees of *fixed* phase shift *between it and the OBS* will cause its meter to move right when the OBS is at zero. Leaving the OBS at zero and moving the receiver to the 180-degree radial, will add 180 degrees phase shift to the fixed 90, which adds up to 270. We already have seen that such a change causes the meter to move from right to left. The meter of our second phase discriminator becomes the To-From meter, which is turned on its side so as to move vertically. In the event of To-From meter failure, bearings may be identified as To or From by rotating the OBS so as to increase its reading. If the Left-Right meter moves left, the bearing is To the station. If it moves right, it is From the station.

Two types of phase shift devices are in use as Omni bearing selectors. One type, using a potentiometer, is economical in production, but is difficult for the service man to adjust. A potentiometer is similar to a volume control; in this case it has four electrical taps and is rotatable through 360 degrees. Some are not continuous electrically, as on the Narco Omnigator, resulting in a vacant area on the attached dial. All are non-linear in calibration, with markings that are widened near the four cardinal points and narrowed in between. The four taps are connected to four separate signal sources and the failure or malfunction of any one usually results in errors only on one-half of the dial.

The second type is a precision electro-mechanical device called a resolver. Two stationary coils, excited from different sources, are mounted on the frame at 90 degrees to one another. A third coil is rotatable by the OBS knob through gearing. Its position with respect to the stationary coils determines the amount of phase shift. Failure or malfunction of the signal for either of the stationary coils will result in errors at all but two points on the dial. Dial calibrations always are continuous through 360 degrees and uniform in spacing. Actually, the electrical circuit for a resolver type of OBS is simpler than for a potentiometer type. However, the components are considerably more expensive. Reliability and accuracy of the resolver types are usually greater over a long period of time.

Although display of the ILS localizer signal is made on the same indicator, there is little similarity between the systems. The airborne equipment for the localizer merely requires two tuned circuits, or filters. One, tuned to 90 cycles, will pass that frequency and reject the 150-cycle tone. The other does just the opposite. The two signals are

(Continued on page 84)

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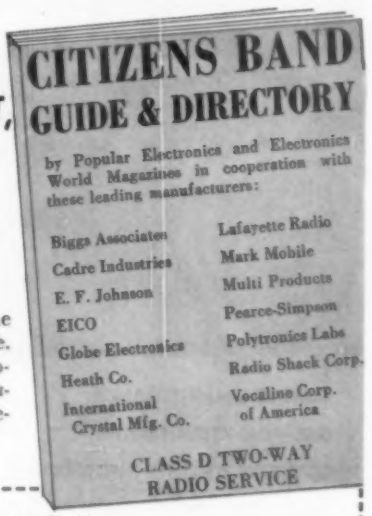

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(Continued from page 83)

rectified, changed from alternating to direct current, for meter operation. The remainder of the circuitry is composed of two adjustments, one for balance and the other for needle sensitivity. If the tones are of equal intensity the needle centers, indicating that the aircraft is on course. Moving to one side of the course reduces one tone and increases the other, causing the needle to move away from center and toward the side on which the correct course will be found. The ILS localizer frequency always has a definite relationship to the glide-path frequency and, in many digital-tuned receivers, a separate section of the frequency switch controls the frequency of the associated glide-path receiver.

Both the VOR and ILS localizer systems produce accurate course information, for the most part. The FAA flight checks all VOR radials that designate an airway, to be certain they are aligned properly. Airborne equipment will produce the greatest course error, but in the more expensive equipment this will be in the order of one degree or less.

Available equipment for VHF communication and navigation ranges from transceivers by Nova Tech and Skycrafters to those sophisticated systems offered by Dare, ARC, Collins, and Wilcox. This article, however, is concerned only with the basic equipment.

Basic equipment for a VFR pilot will provide a minimum number of transmitting channels, a tunable receiver and, perhaps, an Omni converter-indicator with limited accuracy. For pilots engaging in IFR limited to approaches and departures, a 27-channel transmitter and receiving equipment with VOR-LOC capability will suffice for their basic needs. Full IFR capability seems to require a minimum of 90-190 channel communications equipment, dual VOR, or VOR and ADF. This definition by no means is intended to overlook the importance, desirability, or advantages of 360- to 560-channel equipment or duplication of "basic" systems to achieve greater flexibility in operations.

The comparative features of equipment falling within the above definition are listed in Tables I, II, and III. The businessman pilot will find this ready information, and other comments in the following text, helpful in determining which equipment will best fit his basic requirements. It is readily seen that all but the low-priced equipment is now entirely crystal controlled with 90 transmitting channels and 190 receiving channels. Although the Omni and Localizer converter-indicators are listed separately from the communications equipment, and all of them will operate satisfactorily in conjunction with a competitive receiver, they are usually mated with a receiver from the same manufacturer.

There are more features and items of comparison between manufacturers' equipment than there is space for tabulation and discussion. This article should provide sufficient basic information for the aircraft owner to make his own investigation and comparison in light of his own resources and requirements. The reputation of the equipment for performance and reliability, the manufacturer's warranty policy, and

the recommendation of a reliable installation and service agency must all be considered before making an intelligent choice.

You'll know well in advance that you will be in the market for some new equipment. Do a little shopping in the meantime. Talk to people in several shops and to pilots that are using equipment of the class you intend to buy. Generally speaking, equipment that has been tested to determine compliance with FAA Technical Standards Orders (TSO) will exhibit good reliability.

Our tabulation indicates the electrical current required for 13.7 volt operation, as most so-called 12-volt systems are adjusted for this voltage with the generator in operation. To find the current for a 28-volt system, divide the current by two. All manufacturers listed, supply 24-volt units, with the exception of Nova Tech.

Receiver sensitivity is listed in microvolts, or millionths of a volt at the antenna input jack. Unfortunately, all manufacturers do not determine sensitivity in the same manner, making comparison of this feature difficult. Selectivity, the ability of a receiver to reject adjacent channel transmissions, is likewise hard to determine without considerable laboratory work; however, because of their design, the crystal-controlled receivers exhibit good selectivity and adjacent channel rejection. The prospective purchaser of a tunable receiver will want to determine the selectivity of such a unit as part of his own comparison and evaluation.

Taking the equipment in the order it appears in the tables, we find the Collins 17L-8 and 51X-3 at the top of the list. If memory serves us, it was the first of the 90-190 channel equipments to appear on the market. Collins designed it as stand-by equipment for larger aircraft and were quite surprised to find they had a much larger market than anticipated in the single-engine aircraft. These two started a rush of this type of equipment and manufacturers are still adding to the list. To keep the panel-mounted equipment as small as possible (some planes don't have much room behind the panel), some of the receiving circuitry is in the associated power supply. Operational performance is not affected, but some complications result for the service man and it is difficult to use this receiver in a system where you might want to use another power supply.

King Radio Corp. approached the design of its equipment in a manner different from any other manufacturer. Instead of providing a 90-channel transmitter and 190-channel receiver, they designed a 90-channel transceiver with many circuits common to both the transmitter and receiver. This unit, the KY-90, covers only the communications frequencies from 118.0 to 126.9 mc. A single coaxial control provides simultaneous selection of transmitter and receiver frequency. Reception of navigation signals is accomplished by a separate receiver, using the same power supply and audio circuits of the KY-90. When both transceiver and nav-receiver are housed in one package, the system is designated KX-100. The output of the nav-receiver can operate any of the several Omni converters; however, King has its own, dis-

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(Continued from page 85)

cussed later in the text.

Both the KY-90 and KX-100 have a full ten watts of transmitting power, the most powerful among the lightweight, low cost equipment. Both also provide Double Channel Simplex operation when the outer control of the frequency selector is turned to DCS. Frequency of the receiver will be between 120.0 and 120.9 and the transmitter 126.0 to 126.9 depending on the setting of the tenth-megacycle switch. For example, if the switch is set to .7, the receiver will be at 120.7 mc and the transmitter on 126.7 mc. King uses a single vertical antenna for communications and a horizontal antenna for the nav-receiver.

Motorola's LNC-100 system is the only one of the lightweights that has provisions for growth in the number of channels. The transmitter and receiver can both be converted to .05-mc channel spacing by the addition of 11 crystals, and further extended in coverage to 131.95 mc by the addition of four crystals. The transmitter would then have 280 channels and the receiver 480. This extended frequency coverage will most likely be of interest only to pilots contemplating full IFR as the additional channels are now used only by ARTC centers. The LNC-100 is a building block system. From a single receiver and power supply, the system can be expanded by the addition of a transmitter Omni converter, marker receiver and glide-slope receiver. Using a single power supply for all this equipment results in an economical system. Some may object to a single power supply since failure causes all radio equipment to go out. But even with two supplies, if the com-nav power supply quits you're out of business. The only sure way is completely duplicate systems.

There is quite a controversy in progress regarding the use of printed wiring which Motorola uses extensively in the LNC-100 system. Design engineers say it is necessary to keep the size of the equipment down and to increase production efficiency. Others feel it is too difficult for the service man to work on. But controversy or not, printed wiring is here to stay. Motorola uses a screw driver squelch setting, although this is seen often in higher-price equipment. Most pilots prefer the control to be adjustable in flight so they don't hear a tower they're tuned to, until they get close enough to it that the transmissions are important to them. Motorola feels that it should be set to quiet the receiver background "noise" and that the pilot should hear all transmissions.

Although Narco's Mark V is a transceiver, frequency selection for transmitting and receiving are made with separate dials. Crystals are common to both transmitter and receiver, which effected a saving for Narco in crystal costs. The separate tuning dials allow cross-channel communication although it is difficult to imagine where you would use this feature except for Double Channel Simplex. But Narco was forced to design the Mark V in this manner, because the receiver tunes the navigation frequencies as well, and Narco offers a converter indicator system for Omni-Localizer operation. A Mark V and the VOA-3 comprise a complete basic com-nav system.

Narco's VC-27 Simplexer was one of the

first to provide whistle stop tuning for the receiver, and tuning of the transmitter to the selected crystal frequency for optimum power output. Transmitter tuning was required as the frequency range was from 118.1 to 126.7, well beyond the five mc possible with a fixed tuned transmitter. The one-watt output power is sufficient for short-range communication, but cannot compete with the higher-powered equipment for long-range work. Narco offers several power supplies for use with the Simplexer, so that other equipment may be used without duplication of power units. The same power supply used with the Omnigator will provide for a marker receiver, and can power an LFR-3 low-frequency adapter and VOA-3 Omni-converter system.

Thus, though seldom used in this manner, a Simplexer can form the basis for a complete com-nav system.

The VTA-3A transmitter, another Narco product, is designed primarily as a means of extending the channel capacity of the Narco Omnigator or Simplexer units. It uses the same power supply and modulator of the basic unit and is usually provided with crystals for operation in the 121.5- to 126.9-mc range when the Omnigator covers the 118.1- to 123.0-mc range. Actually, the VTA-3A is usable with many transmitters with limited channel capacity manufactured by other companies.

Nova Tech's TR-102 and Nova Star transceivers are the same units as far as the transmitter, receiver and power supply circuitry are concerned. The Nova Star has some added features, which include a switch for whistle stop tuning, and an audio power stage to enable use with a cabin speaker, the latter supplied with its housing as part of the system. Although mike and phone jacks are located on the front panel, their connections are also brought out on the rear plug in the Nova Star unit.

The Nova Tech equipment is quite unique in that three of the four receiving tubes are used in the transmitter modulator circuit, and two are used for both radio-frequency and audio-frequency amplification when the equipment is used as a receiver. Though this reduces the cost of the unit and the price to the customer, there is some loss of performance as a result of this design approach. In the Nova Tech design it manifests itself as a loss of selectivity and sensitivity of the receiver. No degradation of transmitter performance is noticed, however.

Just out on the market is the Nova Star all-transistor Omni. The unit works with any standard VHF receiver, is self-contained, fits a standard instrument hole and does not require additional power. Weight is quoted at 16 ounces. Guaranteed accuracy is two degrees, price $385.

As this is being written, Skycrafters, of Long Beach, Cal., noted for their portable VHF equipment for gliders and their fixed-frequency equipment for airport utility vehicles, are about to announce their new Superphone. The unit, which includes a 24-channel transmitter and a tunable receiver with whistle stop feature, will compete with Nova Tech's Nova Star and,

(Continued on page 88)

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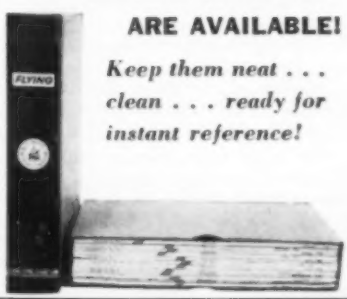

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(Continued from page 87)

when an Omni converter-indicator is available, with Narco's Superhomer. It is attractively packaged, incorporates indirect panel lighting with bulb removable from the front, and exhibits some of the finest workmanship ever seen in this price category. Sensitivity is quite good for such a low-cost unit and the transmitter produces a little less than two watts. Audio circuits are common for the transmitter and receiver, but otherwise they are separate units. Sky-crafters plans to market individual transmitters and receivers at a later date, using the presently developed circuitry and new packaging. At the present writing, they could not furnish a date for Omni converter availability.

Since Bill Lear decided to suspend manufacture of "Mickey Mouse" radio equipment, Narco has had the low-cost com-nav business all to itself. In spite of a near monopoly, Narco has continued to supply good equipment.

Transmitters in the Superhomer and Omnigator require a crystal for each channel. By installing only the crystals he needs, one can maintain his expenditures at the lowest possible level. The greatest limitation is that lower and upper channels cannot be separated by more than five mc without the addition of a second transmitter such as the VTA-3A.

The receivers of tunable receivers must not be too selective lest manual tuning become almost impossible. Also, tuning drift, due to electrical component change, so noticeable during warm-up, would often cause a station to be lost between one transmission and another. Therefore, adjacent channel interference is more noticeable on manually tuned equipment than on crystal-controlled receivers which, because of tuning stability, can be designed to be much more selective.

The Superhomer, with its 12-channel transmitter and self-contained Omni system, is the lowest-priced single-package Com-Nav on the market. The Omni accuracy is not guaranteed to IFR requirements, but is certainly suitable for VFR. In a compromise with cost, some convenience of operation has been sacrificed, as the meter serves as both a Left-Right and To-From indicator with a switch selecting the function. Also the course selection, requiring two operations, is less convenient than a standard system.

With the exception that all controls and indicators are on the front panel, the Omnigator is quite conventional in its operation and display of navigational information. Omni accuracy is within two degrees which is satisfactory for IFR flight. ILS localizer signals are displayed by turning the function switch to LOC and tuning in the appropriate frequency. An aural marker is incorporated in the power unit and is sensitive enough for powered markers, such as those associated with the ILS system.

The Mark VI is designed principally as a navigation receiver, but it also covers the communications frequencies to provide back-up for the main communications receiver. With a separate transmitter it could very well be the receiver for the main Com-Nav system. All circuits are pow-

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ered direct from the ship's electrical system without use of a high-voltage supply. Like the Superhomer and Omnigator, the Mark VI must be mounted at eye level if it is to command the attention it deserves in IFR flight. Since this may not be practical or possible in some airplanes, Narco has provided output terminals at the rear of the Omnigator and Mark VI for operation of a panel-mounted meter.

The Collins VOR converter-indicator is a self-contained transistorized unit that mounts in a standard three-inch instrument hole. Transition from VOR to Localizer is automatic. Tuning in either signal will provide the proper type of operation. Collins offers this with a glide-path needle as an optional, extra-cost feature. The glide-path signal may be furnished by any standard glide-path receiver. Aside from the signal from the receiver, the unit requires only a small current from the primary power source. Actually, the 344D-1 may be used with any Omni-Loc receiver that has a low-impedance output. The King KI-200 is a similar unit and probably it will be offered with a glide-path needle, when King offers its glide-path receiver on which it is now working. Both use a resolver in the omni-bearing-selector circuit.

Narco's VOA-3 requires high-voltage power from the associated receiver, but only a small amount, so it is safe to say it will operate with most any receiver. The converter is a separate unit mounted in any convenient place in the aircraft, with the meter and OBS potentiometer in a second unit located in the instrument panel. It was developed originally for use with the 1016 Sapphire transceiver, but was later proposed for use with the Simplexer and now the Mark V. Its OBS dial is continuous but is recognizable as the potentiometer type by the non-linear calibrations. A second indicator with glide-path needle and flag is available.

Motorola, while it was still Lear-Cal, offered a transistorized Omni unit called a Vortran, very similar to the Collins and King units, but which did not include a localizer function. Motorola dropped this unit when it introduced its LNC-100 system. The Nav-Pac 100 is designed, obviously, for use with the LNC-100 system although, like the Narco VOA-3, it could be used with other receivers quite satisfactorily. It also incorporates an automatic localizer function and an aural marker receiver as well. At a slightly higher price, a single light marker is incorporated. The Nav-Pac 100 also requires high voltage from the associated receiver.

If you are adding only one item of equipment, be sure that your generator can handle the extra load and that you meet FAA requirements for mechanical installation and electrical system capacity. The total current drawn by all equipment in your airplane—radio equipment, lights, fuel pumps, etc., must not exceed 80 per cent of the rated capacity of the aircraft's generator. If it does, you'll have to pay for changing generators, as well as the new radio equipment and its installation. Also, to avoid tying up your airplane, be sure that arrangements are made between the installation shop and the FAA for inspection and approval of the installation *before* the installation is started. END

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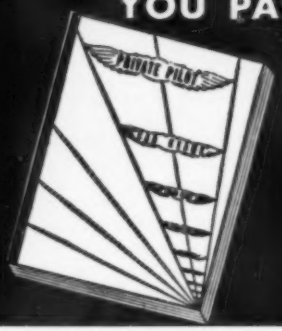

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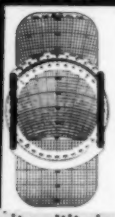

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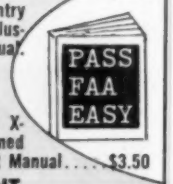

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Convair—Giant of the Air Age

(Continued from page 39)

where they joined the 7th Bombardment Group. From the airport at Malang they struck at Japanese vessels in Manado Bay and at the Langoan airport. One of the three, thereafter, had a forced landing on a reef off Borneo. The crew was later picked up by a Cat, setting a pattern of co-operation between the two Convair-created aircraft which was to be duplicated hundreds of times before VJ Day.

As will be remembered, a few B-17s were based in the Philippines and on other Pacific fields at the time of Pearl Harbor. The Air Corps had received its first B-17 in 1937, but purchases had been sparse. For the first few months of war the "Forts" battled the enemy out there while the pleas of General MacArthur for airpower were unfillable. Then the B-24 began to roll off the production line and it was decided that the globe from the U. S. West Coast to India was a Convair responsibility in so far as strategic bombardment was concerned—B-24s and counterpart Navy PB4Y-1s. And this situation prevailed until in the latter months for the final strikes against the Japanese homeland, the B-29 "very heavy bomber" entered the picture.

This exclusive assignment, however, did not absorb the full capability of the B-24 family. Shades of North Africa, of Ploesti, of Italy, Yugoslavia, Greece, India, Malaya, France—all Festung Europa inclusive of Berlin itself! The B-24s were there too! The pyramids and the Holy Land saw them overhead as well as the Philippines and the Halmaras. Naples shared their wrath with Nagasaki, Berlin with Biak, Czechoslovakia with China.

The last days of Hitler saw B-24s over Berlin and just before the atom bomb fell, they were over Tojo and Tokyo. And then the war was over, and the business of contract termination wrote the epitaph to many a gallant aircraft type—and wrote as well the prologue to the troubled years since.

The spasmodic dispersal of American airpower at a time when it dominated the military power of the world will remain an unforgettable tragedy as long as any airman of those days is alive.

To make the best of this situation, the atom bomb being the fact it was, and is, military authorities rightly saw that a bomb carrier of hitherto impossible range and ceiling was the most advisable stop-gap to Soviet determinations of continuous conquest. Jet engine power was in the offing but not yet available for broad utilization. Any aircraft capable of holding the free world immune from conquest for even a few years would essentially be big-big-big.

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to accommodate long-range fuel requirements and heavy nuclear warheads. And just as essentially it would be multiple-engined with piston power.

The B-36 was conceived far back, in the spring of 1941, long before Pearl Harbor, even longer before the B-29 had taken to the air. General George Marshall, then Chief of Staff for Army, had foreseen that Europe might collapse, and Britain with it, under the Hitler Juggernaut. In such an event, the United States would need a bomber which could strike Europe from North America and return. Convair had submitted the design of such an aircraft, along with three other major companies, Douglas, Northrop and Boeing. By autumn of that year Consolidated had received the go-ahead on two prototype units of an experimental six-engined aircraft. The San Diego plants were saturated with work so the XB-36 program was moved to the Fort Worth plant. The giant bomber, however, had a low priority which got lower still as the tide turned toward the Allies. Nevertheless, the Air Corps had decided that its post-war strategic strength would feature the B-36 and, in 1943, a contract for 100 B-36s had been awarded the builder. The prototype first flew on August 8, 1946, at Carswell AFB, Fort Worth. An aircraft which had originally been intended for defense against a current enemy, was thus providentially ready for defense against a treacherous former ally.

Leaving the giant bomber at this point, let us turn back to Convair and note the results of the war contract terminations.

We find that the company had swiftly closed down its Plant II at San Diego and its satellite plants at Tucson, New Orleans, Allentown, Elizabeth City and Louisville. The Stinson Division, later to be sold to Piper, turned to production of Voyagers, the little four-place private plane. The Nashville plant was converted to manufacture freezer cabinets and kitchen ranges for Crosley. Plant I at San Diego was devoted to development of the twin-engine civil transport, the Convair. Fort Worth, as we have noted, was absorbed with the B-36. The Vultee facility was assigned development looking toward the delta-winged fighter (F-102) and the missile projects Atlas and Terrier. At the beginning of 1946, control of the ACF-Brill Motors Co., bus manufacturers of Philadelphia, and of Brill's subsidiary, Hall-Scott Motor Car Co., of Berkeley, Cal., was purchased.

The problem of management could be put in a nutshell—how to hold together and employ Convair's bed-rock manufacturing ability until the United States could decide upon its post-war aviation policies. At one point, it appeared that a merger of Convair and Lockheed would be the answer. Each company was down to around 13,000 employees and was finding diversification difficult.

Victor Emanuel, who had succeeded Tom Girdler as Convair's chairman of the board, and Robert Gross, president of Lockheed, finally agreed that putting two big headaches in one head was not the answer, and the idea was dropped.

(Gill Robb Wilson's concluding article on Convair will appear in the October issue of FLYING.*)*

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Overbreathing

(Continued from page 47)

supply, and the red hemoglobin is prevented from releasing the abundant oxygen it is carrying to the brain, nerves, muscles and other tissues.

Because hyper-ventilation is usually caused by stress and anxiety, *the person who is overbreathing is not aware that he is doing so.* This curious fact, together with his increasingly poor judgment as his condition worsens, may lead a pilot to mistake the cause of his discomfort—he won't be sure whether he lacks oxygen, or is overbreathing, or both. More trouble is sure to follow unless he can distinguish between these conditions and know how to correct them.

If you are in good health and in good physical condition and have been below 10,000 feet MSL during your flight, oxygen lack alone cannot be blamed for the many symptoms described earlier.

If you are, or have been, above 10,000 feet MSL, *you cannot tell by the physical symptoms alone* whether your problem is too little oxygen or overbreathing. You should immediately follow these steps:

1. Check your oxygen equipment as soon as the symptoms appear. If the equipment involves an automatic diluter-demand type of regulator, switch it to the *emergency* (pressure) setting.

(Be thoroughly familiar with your oxygen equipment. Inspect it faithfully as part of your preflight check. Work out a set routine for checking it during in-flight use.)

2. Immediately begin descent to below 10,000 feet MSL.

3. For at least two minutes, breathe with a *normal depth* of respiration, at a *normal rate* (ten to 20 times a minute), with oxygen mask on and equipment functioning normally.

(If you find that you cannot stop yourself from taking deep breaths, *you must breathe slowly*—one breath in and out, every ten to 15 seconds by your panel clock.)

4. When well below 10,000 feet, symptoms of hyper-ventilation can be relieved by rebreathing your own air in and out of a paper or plastic bag.

5. If the symptoms continue, it is possible that neither oxygen lack nor overbreathing is your problem: there may be a carbon *monoxide* leak. In this case, continue the use of oxygen and the same kind of breathing described in *Step #3*, for 15 to 20 minutes. If you have an automatic diluter-demand regulator, set the mixture at *100 per cent oxygen*, at normal pressure, for this period.

Following these steps will help you to realize just what your trouble is, and to correct it, before you lose your judgment, or your consciousness. END

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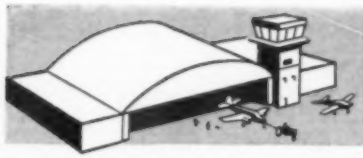

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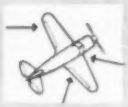

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COMMERCIAL Pilot, single 24, 3 years college, desires flying or combination, Chicago Area. Kendall Chandler, 181 Hillcrest, Chicago Heights, Illinois.

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Classified

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SKYSCRAPER-Heel Shoes, Wasp-waisted Corsets! Photo Catalogs, $2.00. Finecraft, Box 442-P, Hollywood 28, Calif.

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Briefings . . .

(Continued from page 10)

AutoNav homes on, and points, to all commercial broadcast stations, as well as the aviation LF radio stations.

FIRST NON-UNITED STATES citizen to receive certification to fly U. S. registered jet transports is Shaukat Hussain Khan, shown here as he boards a Pan Am jet

homeward bound to Pakistan. Captain Khan trained in this country with Pan Am and will fly jets leased by that airline to Pakistan International Airlines, between London and Karachi.

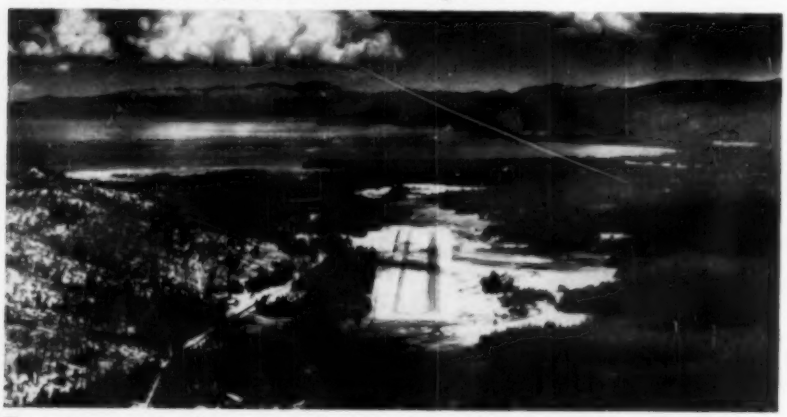
FOLLOWING RECENT signing of bilateral air agreements between Ethiopia, Ghana, Guinea and Liberia, Ethiopian Airlines immediately announced plans for launching the first scheduled trans-Africa service north of the Equator. A development which is expected to hold great significance to the future welfare of Africa, the new service will greatly reduce flying time between East and West Africa. Jets are to be purchased by Ethiopian Airlines to cope with the present boom in business and tourist travel over its established international routes, and to service the contemplated heavy East-West African traffic.

OPENING OF A COMPLETE service for general aviation has been announced by pilot-owners of the popular Sky Haven Motel at Fullerton Municipal Airport, 20 miles east of downtown Los Angeles, Cal. The new operation, Sky Haven Aircraft Sales and Service, offers Piper aircraft sales and service, maintenance of all types of aircraft, air-taxi service and flight training through ATR. Conveniently located on the southwest corner of this modern airport, the Sky Haven motel is a 26-unit luxury establishment with swimming pool, aircraft parking area, and a restaurant next door.

THE LYCOMING 10-540, rated at 290 hp, is the first of this company's new series of fuel-injection engines for use in utility aircraft, to be certificated by FAA. Its first use will be in the new "speed line nacelle" Aero Commander 500-B. The company reports two additional models in the same series are coming along in the near future. The 10-540 is a direct-drive, six-cylinder model incorporating a continuous-flow fuel-injector system. It uses 100/130 octane fuel and has a compression ratio of 8.7:1. Total weight is 437 pounds.

UNDER A RECENTLY ANNOUNCED full-year warranty program, Tactair, Inc., Bridgeport, Pa., manufacturers of automatic flight systems, will replace or service free of charge any parts or components, including gyros, of its new "Gold Seal" T-3 Auto Pilot, for a 12-month period following the installation. Tactair's pneumatically operated, three-directional T-3 automatic flight system is approved for most Beechcraft models, Cessnas and the Piper Apache.

CONSIDERABLE ACTIVITY in new helicopter business is evidenced by recent deliveries. Air Florida, Inc., newly formed charter helicopter passenger service in the Tampa-St. Petersburg, Fla., area, is getting two Republic-built Alouette II jet 'copters. Intermountain Helicopters, Inc., operating out of Chalis and Salmon, Idaho, has a new Bell 47-G3 as does Western Contracting Corp., of Lincoln, Nebr. The Commonwealth of Massachusetts is the latest government body to purchase a helicopter, a Bell 47-J. And, finally, tourists to the Great Smoky National Park now may do their sight-seeing in a Bell-47G, operated by Volunteer Helicopters, Inc., out of Gatlinburg, Tenn.

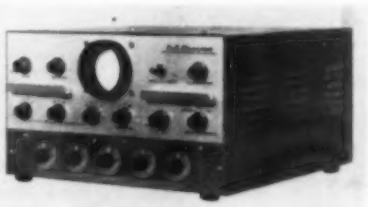


JUST COMPLETING a busy inaugural year, Lake Tahoe Airport (above), serving "The Lake in the Sky" and surrounding California-Nevada resort attractions, now enjoys scheduled daily morning and evening flights out of San Francisco International Airport. Golden Gate Airways, Inc., using eight-passenger twin-engined Beech Super 18s, operates this service. Privately owned aircraft find a cordial welcome, too, from Mac Worden, airport manager. At the same time, however, he cautions visiting "lowland" pilots that this airport, at an altitude of 6,200 feet, demands "mountain flying" skills in landing and take-off, although its runway is 6,200 feet long.

ENGLAND'S DONALD CAMPBELL, holder of the world's speedboat record, visits this country in preparation for his forthcoming attempt at the world's land speed record. He detoured to Lock Haven, Pa., long enough to take personal delivery of a new Piper Comanche for his personal and busi-

ness travels. He's shown here with William T. Piper, president of Piper Aircraft, and Mrs. Campbell. Mr. Campbell will drive a unique turbine-powered car, capable of 500-mph speed in his record attempt scheduled for September at Bonneville Flats, Utah.

DEVELOPED AS A NAVIGATION aid in general utility aircraft on over-water flights, the D-X Navigator, a direct-reading Loran (long-range navigation) receiver, is a new product of the Electro-Nuclear Apparatus Co. of Baltimore, Md. Priced



around $1,500, this is a compact 23-pound device designed for fast, accurate position charting under all-weather conditions as far as 700 miles off shore. The D-X requires 90 watts of power, and is available in either 115-volt AC or 12-volt DC models.

MITCHELL INDUSTRIES' Auto Pilot has been granted FAA approval for the Beechcraft Debonair. Previously approved for other Beech models, including the Bonanza and Twin Bonanza, as well as most other single- and twin-engine business aircraft, the Mitchell, manufactured in Ft. Worth, Tex., is an all-transistor autopilot ranging in price from $1,095 for a two-control model to $3,245 for a three-control system with automatic heading and altitude selectors.

EIGHT IMPORTANT AREAS in aviation safety are not now being adequately studied and call for "further research, development or special monitoring," the Cornell-Guggenheim Aviation Safety Center concludes in its 10th annual survey of air safety research in the U. S. and western Europe. The areas listed include altimetry, collision avoidance, crash fire protection, occupant protection, weather forecasting, subsonic research facilities, private flying and human factors.

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